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Issue #284

# 73 T.M.

# Amateur Radio's Technical Journal

A Wayne Green Publication

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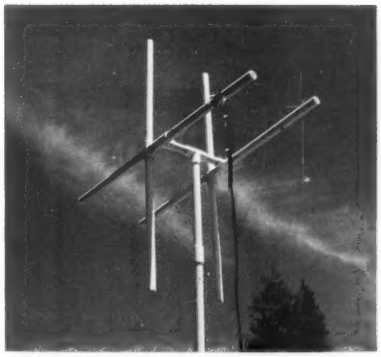

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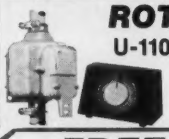

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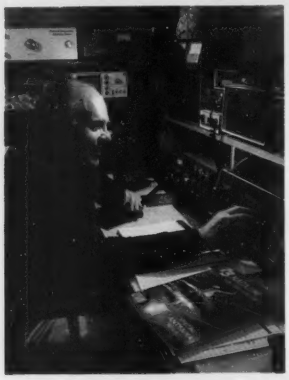

### CODE OR NO CODE?

The FCC's lengthy release reporting on their turning down of the no-code proposal indicated that there was a great unanimity of thought by the hams and clubs who where interested enough to comment on this subject. Morse code must be kept as a fundamental skill for being an amateur—that was the edict. Presumably this was not merely an emotional response but a well-reasoned one—and thus one which all of us should expect to live with and honor.

There was a high degree of agreement that when the chips are down—perhaps referring to EMP and its destructive effect on ICs—CW can always get through. Well, heck, yes, if we have a key at hand to send CW. But more and more rigs are being made without even a key jack! I'd say that in view of this statement of amateur sentiments, we should quickly bring a halt to that and make sure that every new rig has a key jack.

Perhaps two out of three of the transceivers being sold these days are for VHF and designed for phone-only operation. Obviously we are contributing to serious future problems by moving away from the code in this way. I suggest that our first response to this unanimity on the code be to put pressure on the manufacturers not only to put a key jack on every hand transceiver, but to insist that they build a small key right into them and include a tone modulator.

If you remind the manufacturers that you are serious about Morse code—that you really believe it is important (you were being truthful in your comments to the FCC, right?)—they'll have to build CW into their rigs. And if they don't respond, I might follow up with a proposal to the FCC to make it illegal to sell a transmitter without a key jack. All hand rigs should have the complete key built in, obviously, since there is no practical way to hold the rig in one hand, the key in the other, and then try to send.

It will be easy to build a small paddle key into our HTs. With that you will be able to send with one paddle as a straight key or with both as a speed key. And, of course, speed is the only way to go for emergency communications.

Speed. Hmmm. That brings up a major problem. With CW now recognized by the FCC via your comments on the no-code proposal as being of far more importance than previously thought, we have a grave responsibility. When The Chips Are Down (WTCAD) and hams are the only means of communications in an emergency—and we have to use CW—code speed is going to be of incalculable importance. Even relatively small emergencies seem to generate enormous amounts of message traffic, so we will be in one hell of a mess if some turkey in the chain that we are depending on can't handle the code at a reasonable speed. One lazy jerk could bog everything down, bringing discredit to our entire fraternity.

Well, then, granted that your comments are right and CW is our number one means of communications, what code speed should we accept as adequate? In the commercial world, back when they used the code instead of digital communications a couple generations ago, 35 words per minute was the accepted code speed. That was average. Is there any reason why we should be any less than average? Of course not. We should be better than the old average commercial ops, right?

This means that we really

*Continued on page 108*

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The TS-930S is loaded with all the special features that you always wanted in an HF transceiver. Full coverage of the 160 through 10 meter bands, including the new WARC frequencies, (easily modified for HF MARS), plus a general coverage receiver that can tune any frequency from 150 kHz to 30 MHz. Operation in the SSB, CW, FSK, and AM modes, with selectable full or semi CW break-in. All solid-state, with 250 watts PEP input on SSB, CW, FSK, and 80 watts input on AM. SWR/power meter. Triple final protection circuits plus two cooling fans built-in. 10-Hz step synthesized frequency control. Available with optional automatic antenna tuner built-in, another industry first! Dual digital VFO's. Eight memory channels that store both frequency and band information, with internal battery back-up, (batteries not supplied). Dual mode adjustable noise blankers, especially effective in eliminating "woodpecker" type interference. SSB IF slope tuning, for maximum rejection of interference. CW variable bandwidth, with pitch and sidetone control. IF notch filter. Tuneable audio peaking filter. Unique six digit white fluorescent tube digital display is easy-on-the-eyes during those long contests. RF speech processor, for higher average "talk-power." SSB monitor circuit. 4-step RF attenuator. VOX. 100-kHz marker. AC power supply built-in, 120, 220, or 240 VAC.

**TS-930S Optional Accessories:** AT-930 automatic antenna tuner, SP-930 external speaker, with selectable audio filters, YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filter, YK-88A-1 (6 kHz) AM filter, all plug-in type. SO-1 commercial stability TCXO, MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, MC-42S mobile hand microphone, TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter, 160 ~ 6 meter, SW100A SWR/power/volt meter 160-2m HS-4, HS-5, HS-6, and HS-7 headphones.

Isn't it about time you stepped into the winner's circle?

More information on the TS-930S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

*Specifications and prices are subject to change without notice or obligation.*

# KENWOOD

*...pacesetter in amateur radio*

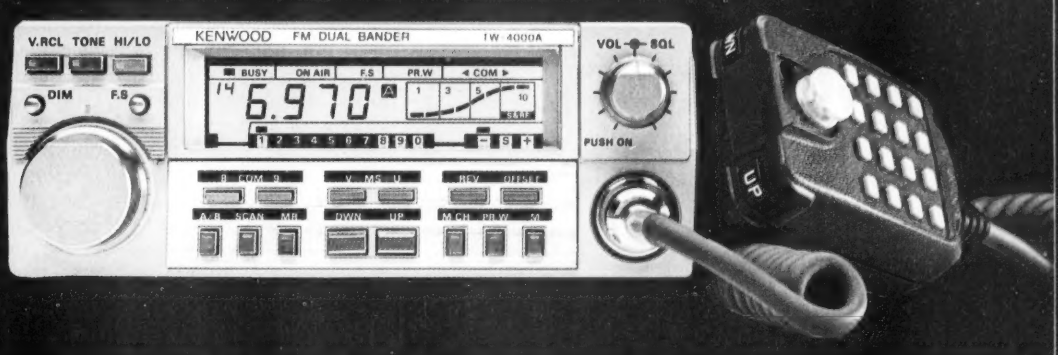
**Optional FC-10 Frequency Controller**
Connects to the TM-201A or TM-401A. Convenient control keys for frequency UP/DOWN, MHz shift, VFO A/B, and MR (memory recall or change memory channel). A green LCD display indicates transmit/ receive frequencies, memory channel number, ALERT, and SCAN (with blinking MHz decimal).

## TM-201A/TM-401A

**TM-201A/TM-401A "comp-ACT"... tough act to follow.**

The word "compact" best describes the TM-201A VHF (a big 25 watts!) or the TM-401A 70-cm (12 watts) mobiles. Measures 5.6Wx1.6Hx7.2D inches (the TM-201A and TM-401A are the most compact rigs available). Ideal in size, their performances are superlative. Each features a HI/LO power switch, dual digital VFO's built-in, 5 memories plus a "COM" channel with lithium battery back-up, memory scan, programmable band scan, priority alert scan, and GaAs FET RF (front end) amplifiers. They have a highly visible yellow LED digital display, a repeater offset switch, a reverse switch, and a "beeper" to confirm operation of various switches. For superior sound quality, the separate, external speaker, can be easily mounted to project the sound in the desired direction. A 16-key autopatch UP/DOWN mic. allows easy remote operation of major front panel functions. Thanks to KENWOOD, compact radios are now available for the popular VHF and UHF bands providing high performance and superior sound quality.

**Other TM-201A/TM-401A Optional Accessories:**
TU-3 Programmable two-frequency CTCSS encoder, KPS-7A fixed station power supply, MA-4000 dual-bander mobile antenna with duplexer, SW-100A/B SWR/power meter, MC-55 mobile microphone with time-out timer.




## TW-4000A

**TW-4000A FM "Dual-Bander"**

KENWOOD'S TW-4000A FM "Dual-Bander" provides new versatility in VHF and UHF operations, uniquely combining 2-m and 70-cm FM functions in one compact package. It covers the 2-m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, and the 70-cm band (440.000-449.995 MHz), all in a package only 6-3/8 W x 2-3/8 H x 8-9/16 D inches. RF output power measures 25 watts on either band. The TW-4000A features a large, easy-to-read LCD display, front panel illumination for night operations, 10 memories with OFFSET recall and lithium battery backup, programmable memory scan, band scan in selected 1-MHz segments, priority watch function, common channel scan, dual digital VFO's, repeater reverse switch, GaAs FET front ends, rugged die-cast chassis, "beeper" through speaker, a mobile mount, and a 16-key autopatch UP/DOWN mic.

The new optional VS-1 voice synthesizer has everyone talking! A voice announces the frequency, band, VFO A or B, repeater offset, and memory channel number when these functions are selected.

**Other TW-4000A optional accessories:**
VS-1 voice synthesizer, TU-4C programmable two-frequency CTCSS encoder, KPS-7A fixed station power supply, SP-40 compact mobile speaker, SP-50 compact mobile speaker, MA-4000 dual-band mobile antenna with duplexor, MC-55 mobile microphone with time-out timer, and a SW-100B SWR/power meter.

More information on the TM-201A/TM-401A and TW-4000A is available from authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street Compton, California 90220.

*Specifications and prices are subject to change without notice or obligation*

# From Base to Beams

*Home-brew from the ground up! Here's how to build a tower and top it off with performance-proven antennas.*

*Harry D. Hooton W6TYH*
*1420 Shamrock Lane*
*Lincoln CA 95648*

During my 53 years as a licensed radio amateur, I have owned a number of masts and towers ranging from the old-time A-frame wooden mast to a modern 80-foot commercial steel tower. At the age of three score and ten plus two, I am no longer enthusiastic about climbing and working on top of a high tower of standard design and construction.

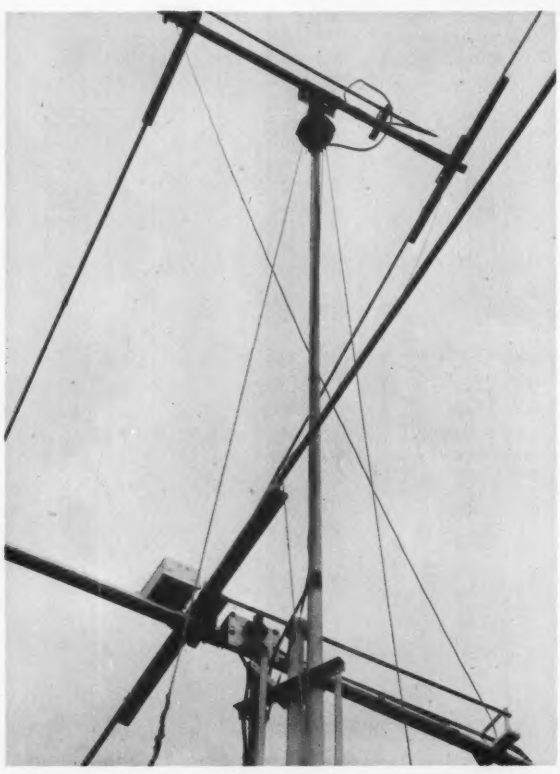


*Photo A. The two monobander arrays mounted on the tower. The upper array is a 2-element, 15-meter yagi using a line-bazooka matching system. The 15-meter array is rotatable over 360 degrees. The 10-meter, 3-element yagi also used a modified line-bazooka matching system. The 10-meter array is rotatable over a 60-degree arc. The 10-meter array is used strictly for communication with the South Pacific area, VK, ZL, etc.*

Since 1978, I have been experimenting with multi-mode arrays, some of which are physically large and electrically complex. These antenna systems require many measurements and adjustments necessitating removal of the array from the tower and reinstalling it after the adjustments or changes are completed. To further complicate matters, W6TYH is located in the country, far away from other hams. Most non-ham neighbors are less than enthusiastic when it comes to raising and lowering the usual amateur array that goes up or down perhaps once a year. When an array must be raised, lowered, and raised again every day over a period of perhaps two weeks, helping-hand neighbors or friends are conspicuous by their absence. Long ago, I found that the dyed-in-the-wool antenna experimenter is regarded by his neighbors (and by some fellow hams) as a kind of nutty individual to be avoided at all times when arrays are to be installed or removed from the tower.

Obviously, what is needed is an antenna support structure that can be easily installed at minimum cost and will permit one man to install or remove arrays safely and easily. The tower to be described is designed to fulfill these requirements.

**Tower Design and Construction**

The multi-mode array, because of its large size, requires a strong tower. Also, the tower, if possible, should be made free-standing since guys and other support devices make the raising or lowering of an array difficult. When matching or phasing adjustments are made, it is essential that the array be at least 15 to 20 feet above the ground. Otherwise, there will be an excessive amount of "cut and try," resulting in much labor and a waste of time. In the interests of economy, it is desirable to design the tower so that readily available accessories such as extension ladders, hoists, etc., can be used when required. All of the materials should be available locally; scrap or surplus iron pipe and angle-iron cross members can be used. The tower can be constructed without welding or brazing techniques (usually

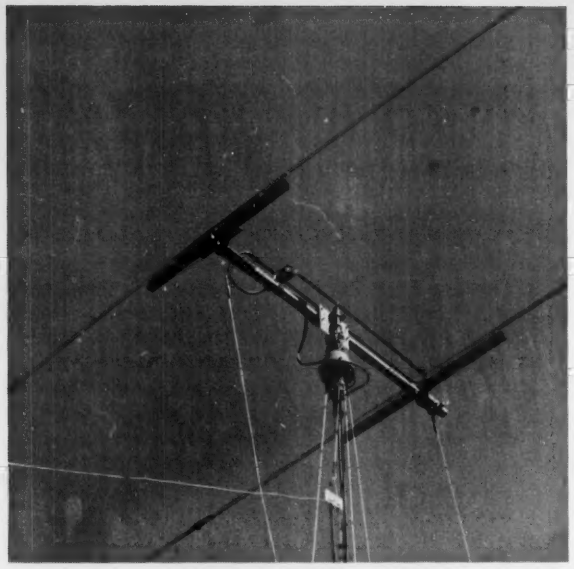


*Photo B. The tower top section showing the rotator and the 15-meter array. The matching stub, made from two copper tubes, is mounted on insulators above the boom. Note the ⅜-inch stabilizing ropes attached to the bottom of the rotator unit. Also note the trailing ⅜-inch nylon ropes attached to the ends of the boom. These are used to secure the array during windstorms. This tower and array have survived winds of over 60 mph. The tower also supports a 40-meter inverted-V dipole.*

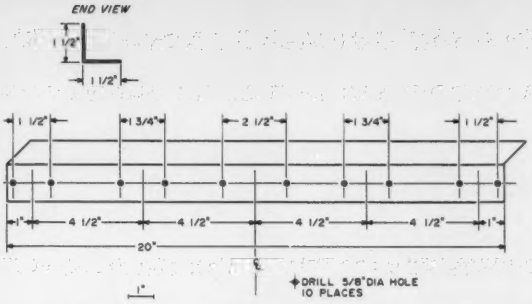



*Fig. 1. Cross-member dimensions. Sixteen pieces of angle iron required—1½" wide each side.*

not available to the average ham).

As shown in the photos and drawings, the tower is constructed as a cage of four ½-inch-diameter iron pipes arranged around a 1¼-inch central pipe core. The tower shown here is made up from black, non-galvanized iron pipe which was obtained from a scrap-metal dealer. To prevent rusting out with time, the black iron pipe must be painted, first with a primer coat and then with two coats of implement enamel. If you use galvanized pipe, it is not necessary to paint the tower unless this is desirable for aesthetic purposes. The four ½-inch pipes are firmly attached, by means of angle-iron cross members and U-bolts, to the large-diameter center pipe. The center pipe extends upward 20 feet above the ground. The ½-inch pipe is manufactured in 21-foot lengths. For ease in handling, each 21-foot length is cut into two 10-foot, 6-inch lengths. The shorter lengths are threaded at each end so that two or more sections can be connected together with standard ½-inch pipe couplings. The tower is extended upward by adding the 10-foot, 6-inch lengths to the desired height. Although the cage structure of this particular tower extends upward only 20 feet, it should be possible to construct a free-standing tower to a height of at least 35 to 40 feet above the ground.

If a higher cage structure is desired, the use of appropriate guys is recommended. With a 20-foot-high cage, an array can be raised to about 35 feet above the ground. With a 40-foot-high cage, an array can be raised to at least 50 to 55 feet above the ground provided, of course, that the tower structure is properly guyed. The 20-foot cage height was selected so that a standard 20-foot aluminum extension ladder can be placed against the tower, making it easier to climb.

The array is mounted on the top of a 21-foot-long, 1½-inch iron pipe placed vertically against the cage section. By means of winch and ratchet, this pipe can be extended about 16 to 18 feet above the top of the cage section for a total height of about 36 to 38 feet. This feature will be described in more detail later. The angle-iron cross members are spaced at about 2½-foot intervals up the central pipe. The tower is erected in exactly the same manner as that of a commercial radio- or TV-station tower—by adding on sections until the desired height is obtained.

**Tower Installation**

First, select a suitable site for the tower. If you expect to be taking arrays up and down the tower frequently, do not erect the tower against the side of a building. Make certain that the array, when mounted on the tower, can rotate freely without coming near other antennas, trees, power lines, metal roofs, or buildings. Trees and other non-metallic objects will have no effect, for all practical purposes, on the tuning or operation of an array, provided that the element tips do not approach closer than 15 or 20 feet during operation. If the array is mounted within 20 to 25 feet of a metallic object, such as a metal roof or power line, the line swr will usually vary as the array is rotated. Arrays mounted close to any object, metallic or not, are often noisy on reception.

Once the site is selected, dig a hole in the ground as shown in Fig. 2. The hole should be about 18 inches across. The depth will depend upon the type of soil at the selected site. For clay or similar hard-packed soils, a depth of about 4 feet will be sufficient. If the soil is sandy or gravelly in nature, the hole should be made deeper, to perhaps 5 or 6 feet. At the W6TYH antenna site, the soil is decomposed granite which packs solid in dry weather but becomes very soft during the rainy season. The hole for the tower base was dug to a depth of about 5 feet and side brace supports were added to the tower at a height of about 8 feet above the ground. The ends of the side supports (½-inch pipe) extend into the ground for about 3 feet and are held firmly in place by "deadmen" made by pouring concrete in each hole.

Fill the bottom of the hole to a depth of about 4 inches with egg-size gravel. Stand the large center pipe on its end on the gravel and guy or brace it in an upright position. Pour another 2 or 3 inches of gravel around the center pipe. This allows it to extend below the base of the concrete and also permits moisture from inside the center pipe to drain into

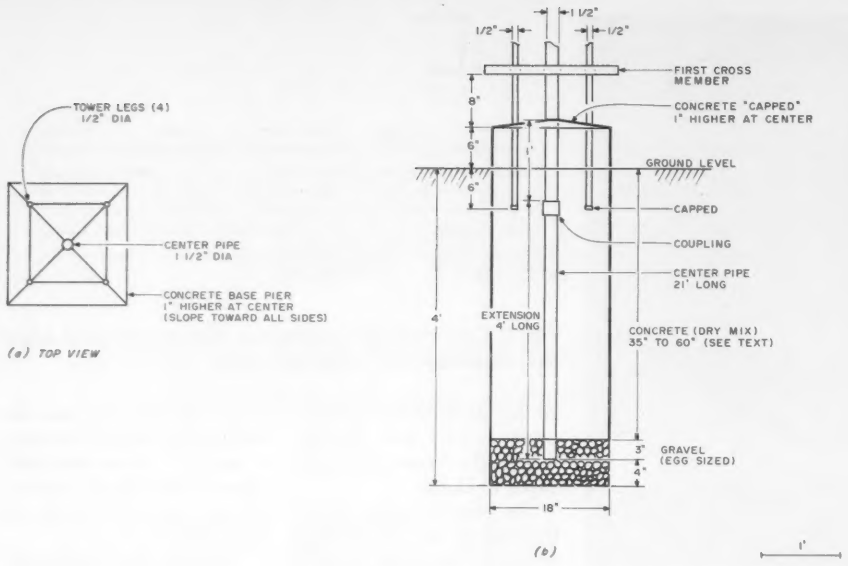



*Fig. 2. Tower base.*

the gravel. Before pouring the concrete mix, coat the center pipe, about 3 inches above and below the space where the top of the concrete base is to be located, with waterproof asphalt roof-patching material. Check with a carpenter's plumb and level to make sure that the center pipe is plumb before pouring the concrete, then repeat the process afterward. While plumbing the center pipe, do not pull it up into the liquid concrete or push it down into the ground. The lower two or three angle-iron cross members should be attached to the center pipe before it is placed in the hole. With the hole filled to within three or four inches below the surface of the ground, allow the concrete to "set" for about 48 hours.

After the concrete base has solidified, attach the first four ½-inch iron-pipe cage uprights as shown in Fig. 3. The bottom ends of the ½-inch pipes are capped and will extend downward about four inches below the space where the top of the concrete base will be located. It is not necessary to provide for drainage of the side pipes provided that each member is sealed by the caps at the top and bottom. When the side pipes are securely fastened to the angle-iron cross members, using the smaller U-bolts, finish pouring the concrete and crown the top of the base, as shown in Fig. 4, to prevent water from accumulating at the point where the upright

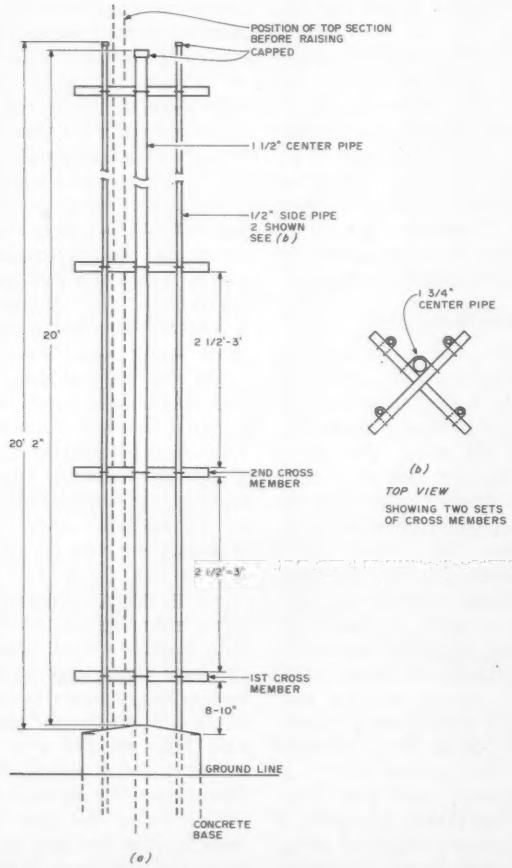



*Fig. 3. How ½" pipes are attached to vertical center pipe.*

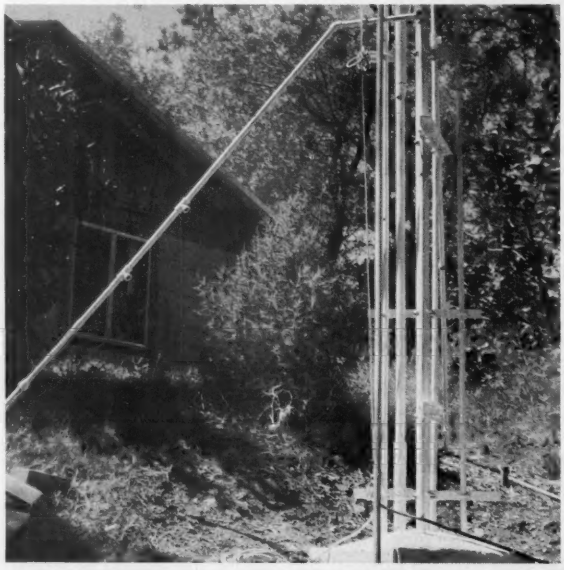
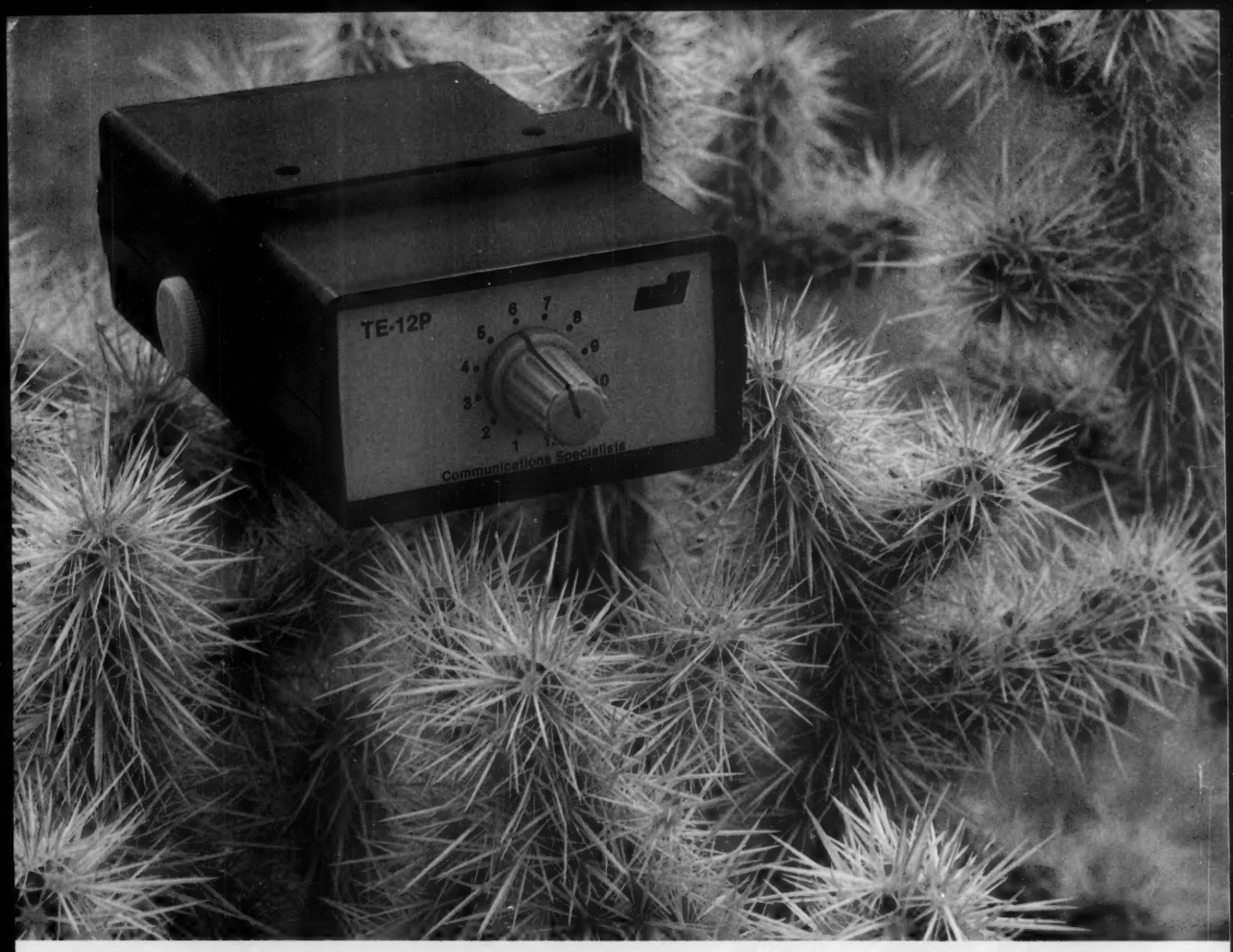


*Photo C. Lower section of tower showing construction. The tower has two braces (½" pipe) attached 8 feet above ground. The lower cage section extends upward 20 feet above the concrete base.*

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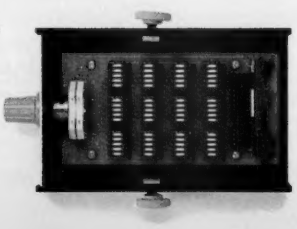

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| 74.4 WA | 91.5 ZZ | 110.9 2Z | 136.5 4Z | 167.9 6Z | |
| 77.0 XB | 94.8 ZA | 114.8 2A | 141.3 4A | 173.8 6A | |
| 79.7 SP | 97.4 ZB | 118.8 2B | 146.2 4B | 179.9 6B | |
| 82.5 YZ | 100.0 1Z | 123.0 3Z | 151.4 5Z | 186.2 7Z | |

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members enter the base. Again allow the concrete base to harden for about 48 hours before assembling the remainder of the tower.

After the base section has been installed, mount the angle-iron cross members at intervals of about four feet, all the way up to the top of the center pipe, and secure the four ½-inch pipes in place with their U-bolts. The U-bolt nuts should be drawn tight so that the joint is rigidly secure.

Although this tower is sufficiently strong to be self-supporting at heights of up to 40 feet, for safety's sake, while working on the tower, it is advisable to attach at least three guys at the 20-foot level, space them around the tower 120° apart, and secure them to iron stakes driven into the ground. There is always the possibility when working on a new tower that the concrete is not completely set and the tower may fall when it is unbalanced by the weight of a man climbing it.

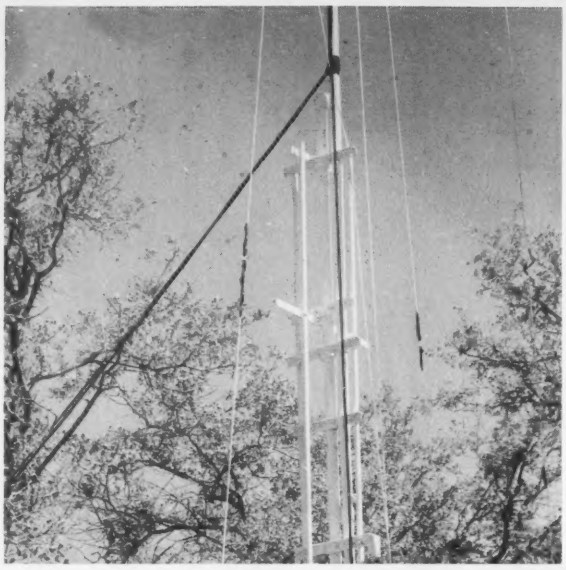

*Photo D. Midsection of tower showing how top section of pipe is mounted. The top section can be extended 18 feet above the 22-foot bottom section—a total height of 40 feet. Note that the 52-Ohm coaxial cable and the rotator control cable are dressed away from the tower while the top section is being raised.*

### The Adjustable Upper Section

After the 20-foot cage (lower) section has been installed, the adjustable upper section, a 1½-inch-diameter, 21-foot-long iron pipe, is placed vertically against the cage section, parallel with the 1¾-inch center pipe. The lower end of the adjustable section rests on top of the concrete base. With a rope or wire, temporarily tie the 1½-inch pipe to the center pipe at the top, center, and bottom of the cage section to keep it upright. Prepare four 1¾-inch U-bolts as shown in Fig. 5. The two standoff nuts on each U-bolt will allow the U-bolt to be rigidly mounted on the angle-iron cross members and keep the 1½-inch pipe upright while permitting it to be raised.

This method is probably the simplest means of allowing the upper section to be raised or lowered while still maintaining a safe and strong mount. If the upper section is to be left permanently in the raised position, when it is in its final position, each of the 1¾-inch U-bolts is removed, *one at a time*, and the two standoff nuts are removed. The U-bolt is now reinserted through the two holes in the angle-iron cross member and its two remaining nuts are drawn down tightly. If the upper section is to be raised and lowered frequently, leave the U-bolts as originally installed and secure the top section as will be described later.

Depending on the height of the lower cage section (20 feet in the prototype tower), the 1½-inch pipe will extend about 1 or 2 feet above the top of the cage section. Thus, it can be reached easily from a 20-foot aluminum extension ladder placed at an angle against the side of the tower. In the photos and drawings you will notice that the last angle-iron cross member, at the top of the cage section, extends outward about 6 inches from each ½-inch side pipe. My 20-foot extension ladder is fitted with two bicycle-hanger hooks at the top. When the ladder is extended, the two hooks fit over the ends of the angle-iron cross members, keeping the ladder securely in place. The lower end of the ladder rests on the ground but is held in place by tie wires to two iron stakes driven into the ground. Since the ladder is placed against the tower at an angle, it is much easier to stand on and more comfortable than trying to hang on to the tower with one hand and work with the other. A strong web safety harness attached to the tower enables me to work in comfort and with safety.

### Installation of the Rotator Unit

The array shown in the photos is a 2-element beam antenna similar to that described in the May, 1980, issue of *73*. The rotator unit used with this antenna is the CDE AR-22 which is de-

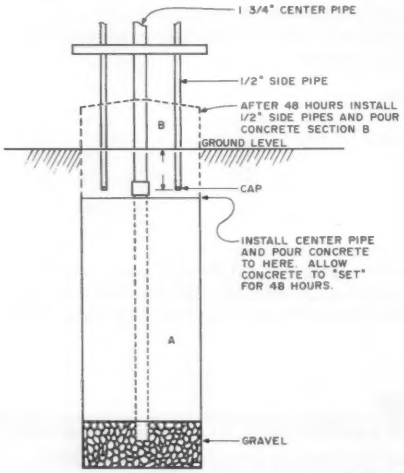
1 3/4" CENTER PIPE
1/2" SIDE PIPE
AFTER 48 HOURS INSTALL 1/2" SIDE PIPES AND POUR CONCRETE SECTION B
B
GROUND LEVEL
CAP
INSTALL CENTER PIPE AND POUR CONCRETE TO HERE. ALLOW CONCRETE TO "SET" FOR 48 HOURS.
A
GRAVEL

*Fig. 4. Second step in pouring concrete base.*

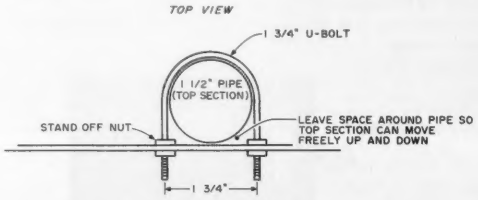
TOP VIEW
1 3/4" U-BOLT
1 1/2" PIPE (TOP SECTION)
STAND OFF NUT
LEAVE SPACE AROUND PIPE SO TOP SECTION CAN MOVE FREELY UP AND DOWN
1 3/4"

*Fig. 5. U-bolts for supporting top section.*

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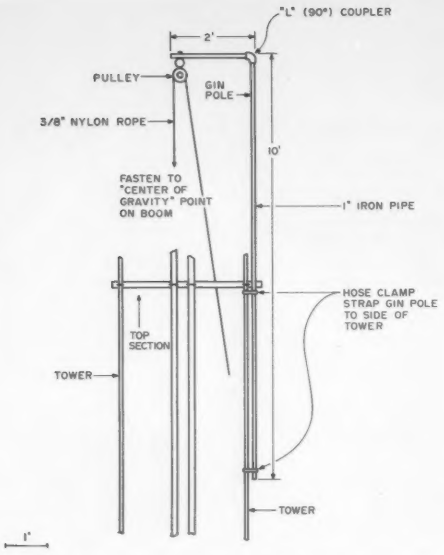


*Fig. 6. Gin-pole assembly for raising array.*

signed for use with large TV receiving antennas. This rotator is perfectly suitable for short-boom, 2- or 3-element beam antennas designed for operation on 10 or 15 meters. For long-boom arrays, use the Ham rotator which is designed to support and rotate a much heavier load. When the AR-22 or any similar unit is used with long-boom arrays, the up and down rocking motion of the boom in a windstorm will damage the gears of the rotator unit.

If you look closely at the photograph, you will notice a trailing ¼-inch nylon rope attached to each end of the boom. In normal use, the ropes simply hang down and rotate with the antenna. During windstorms, however, they are used to lash down the array to prevent the rocking of the boom referred to above. Two other ¼-inch nylon ropes are attached to the guying loops on the bottom edge of the rotator unit and serve to stabilize the upper section and the array during severe windstorms. Using these precautions, the tower and array have been subjected to a 70-mph wind without damage.

The 4-wire control cable should be attached to the rotator before it is installed on the tower. The terminal boards on both the rotator and control units are marked 1, 2, 3, and 4, left to right. The flat 4-wire rotor cable has one bright (tinned) conductor and three plain copper wires. The tinned (bright) lead connects to terminal 1 on both the rotor and control units. The second conductor is then connected to terminal 2, etc. If the terminal boards are wired in this manner, either unit may be disconnected and reconnected without wiring errors.

After the rotator and control units are electrically connected together, plug the control unit into the 110-V-ac source and turn the indicator pointer to NORTH. When the rotator has stopped turning, mark one side of the upper section with chalk or a spot of white paint. When the rotator is installed on the top section, turn the marked side of the unit toward the north. Tighten the mounting U-bolts until the saw teeth of the clamps bite into the metal pipe. The easiest way to lift the rotator unit to the top of the cage section is to raise it with a rope and pulley. With the safety belt or rope attached to the tower, lift the rotator unit over the top end of the 1½-inch pipe, turn the white spot toward the north, and tighten the U-bolt nuts.

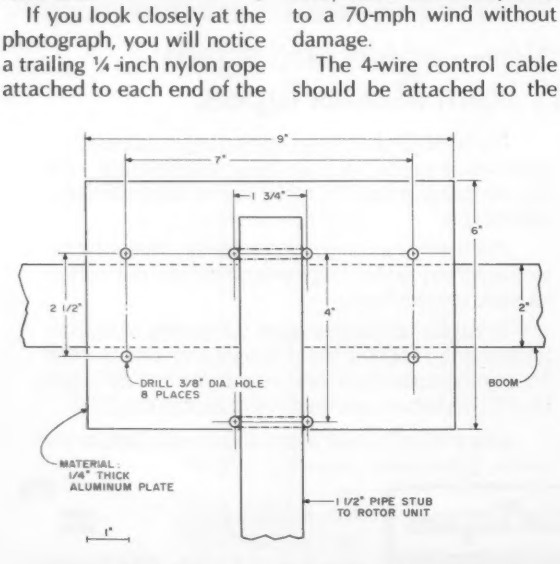


*Fig. 7. Boom-to-stub mounting.*

### Installing the Array

For an easy installation of the array, make up a gin pole as shown in Fig. 6. The 12-inch L arm has an attached rope and pulley as shown. If the array weighs 40 pounds or less, the rope can be a length of ¼-inch nylon. For heavier arrays, a ½-inch nylon rope is recommended. Make sure that you have the proper size pulley for the rope in use and that the rope runs freely through the pulley opening.

One end of the rope is tied to the center-of-gravity point on the boom. Have someone hold the other end of the rope, taking up the slack as you climb the ladder guiding the array up the tower. When you reach the top of the ladder, have the assistant pull on the rope to raise the array to a point about a foot or so above the top of the rotator. Carefully lower and guide the array mounting stub into the rotator mount. Tighten the U-bolt nuts until the teeth of the clamps firmly dig into the metal pipe stub. The boom-to-stub mounting assembly is illustrated in Fig. 7.

### Raising the Top Section

After the rotator and the array are installed as outlined above, we are ready to raise the top section to maximum height. The coaxial transmission line is connected to the array feedpoint before the top section is raised. The junction of the line and the feedpoint must be wrapped with several layers of plastic tape to prevent the entry of moisture. If the coaxial line is made a multiple of a half wavelength, the swr bridge can be inserted in series with the line at *any* half-wave point and the swr or impedance value indicated will be the same as that at the array feedpoint. The coaxial line and the control cable should be dressed away from the tower while the top section is being raised. Use plenty of slack in these lines to prevent them binding or snagging on the tower cross members.

As mentioned previously, the 1½-inch pipe top section is held in the vertical position by the U-bolts acting as slip rings. If you intend to raise or lower the top section frequently, it is worthwhile to install a low-cost winch and cable assembly, such as that used on trailers for small boats, to allow the section to be cranked up or down with little effort. Since W6TYH is located on a ranch, we have available several devices

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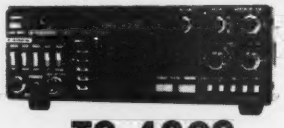

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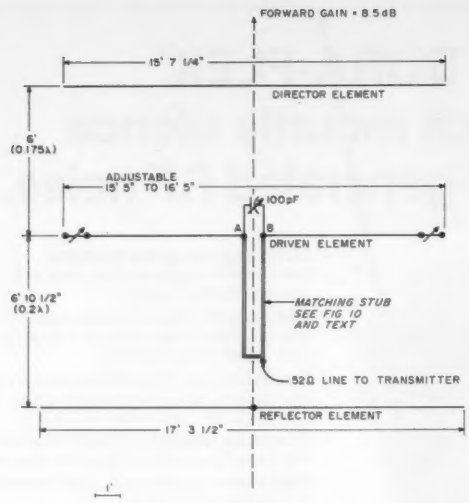


*Fig. 8. Dimensions of 3-element 10-meter array.*

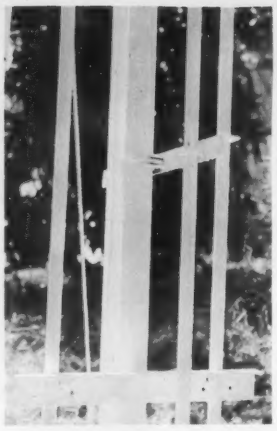

*Photo E. Cross-member constructional details.*

that are useful for lifting or hoisting heavy objects such as the tower top section. The device that we used is generally referred to as a "come-along" and has a ratchet operated by a long handle. To raise a load, the handle is pumped in the same manner as that of an automobile jack. A small-size hoist that sells for about fifteen dollars at auto parts stores will lift an 800-pound load to about 20 feet.

**Guys**

This tower is free-standing and is not guyed in the usual sense of the term. However, a pulley with about 100 feet of ⅜-inch nylon rope is attached to the lower section of the rotator unit, primarily for the installation of a 40-meter inverted-V dipole antenna. In addition, two 60-foot, ⅜-inch nylon ropes are tied to the guying loops at the bottom of the rotator. During normal weather conditions, these ropes are simply dressed down one side of the tower and secured to the lowest cross member. During high winds, however, the ropes can be played out as guys and used to stabilize the tower. Also, you will notice that each array has a length of ⅜-inch nylon rope trailing from each end of the boom. During normal operation, these ropes simply hang down and rotate with the array. When the weather is bad, with strong winds, the trailing ropes are secured to the tower to prevent the arrays from rocking up and down which might damage the gears of the rotator unit.

**The Arrays**

This tower has supported many arrays during the past several years. Photo A shows the two arrays in use at present. The upper array is a 2-element, 15-meter beam antenna which was described in the May, 1980, issue of *73*. This array, the LB-2, has been in use for about 7 years and has proved to be an excellent DX antenna for both transmitting and receiving. The forward gain is 5.3 dB over a dipole under similar operating conditions. For constructional and adjustment data, refer to the article in the above-named issue.

The second array (at the lower level) is a 3-element, 10-meter array designed for maximum forward gain consistent with optimum front-to-back ratio. The forward gain is 8.5 dB over a dipole. The spacings of the elements and the element lengths, together with the dimensions of the matching system, combine to produce a perfect impedance match between the array feedpoint and the 52-Ohm coaxial transmission line. The dimensions of the 3-element array are given in Fig. 8.

The driven and parasitic elements are made up from the popular "hobby" aluminum tubing sold at many hardware stores and building-supply houses. The center sections are 8-foot lengths of ¾-inch-diameter tubes (0.055-inch wall thickness). With the 0.055-inch wall thickness, a ⅝-inch o.d. tube will telescope snugly within the ¾-inch o.d. tube.

The inside and outside surfaces of these tubes have an oxidized finish which must be removed from the two surfaces that make electrical contact. To remove the oxidized finish from the telescoping portion of the smaller tube, sand its outside surface with 00 sandpaper and then polish it with steel wool until the surface is bright and shiny. The finish may be removed from the inside surface of the larger tube by wrapping a smaller diameter wooden dowel with a strip of sandpaper or emery cloth and moving it up and down inside the tube until the inner surface is bright and clean. Before the elements are finally assembled, the telescoping contact surfaces should be coated with an antioxidizing compound, available at most electrical-supply stores.

After the reflector and director elements are assembled and adjusted to the correct lengths, the electrical connection may be made secure by four or five self-tapping stainless-steel sheet-metal screws arranged in a spiral around the tube. After the joint is made secure electrically, wrap it with several layers of plastic tape to keep out air and moisture. If each end of each element is sealed with a wooden plug and waterproof cement, the joints will not corrode and will maintain good electrical contact for several years.

**The Driven Element and Matching-Stub Adjustments**

In the stub-matching system, the dimensions of the stub and the overall length of the driven element are critical. The stub acts as an inductive reactance ($X_L$) and the antenna is adjusted to act as a capacitive reactance ($X_C$). The correct combination of the two reactances will resonate the driven element at the desired frequency, 28.6 MHz in this case. The stub also acts as a balun, converting the 52-Ohm unbalanced impedance at test point A to a balanced 17- to 20-Ohm impedance at the center of the driven element. The impedance stepdown ratio (about 3 to 1) is determined by the ratio of the stub, $X_L$, and the antenna, $X_C$. With stubs of the specified dimensions, the length of the driven element, tip to tip, will be about 5 inches shorter than the length required for resonance with the common gamma match. The bandwidth of the array, each side of the center frequency, is dependent upon the correct ratio of the two reactances and the spacing of the two stub conductors. Extensive experimental work has

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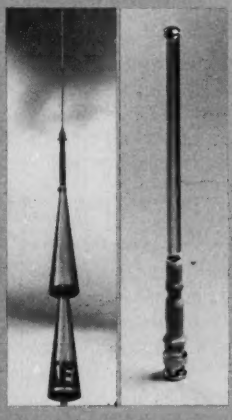

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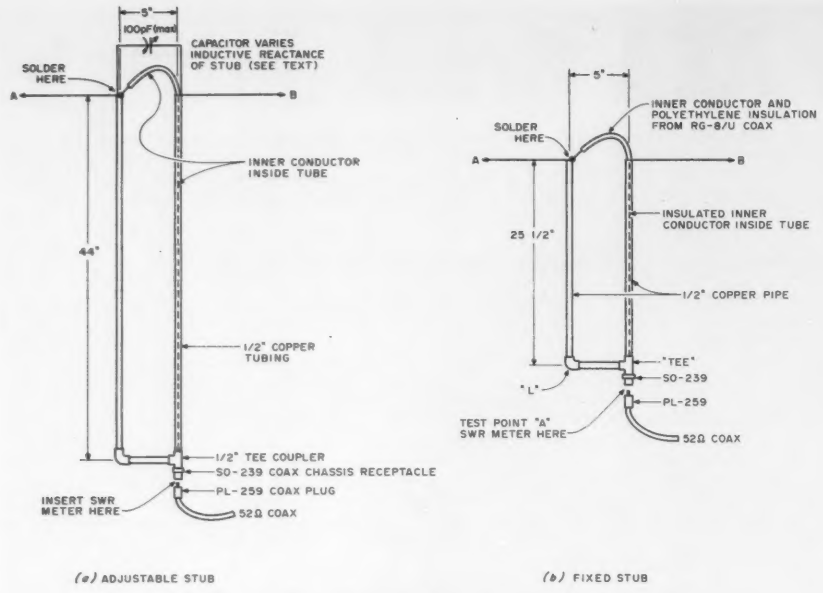


*Fig. 9. Matching stubs for 10-meter array.*

shown that best results on the 15-meter band are obtained with the two ½-inch tubes spaced 3½ inches, center to center. This spacing corresponds to a surge impedance of about 360 Ohms. With a shorted stub 45 inches long and spaced 3½ inches, the bandwidth of the LB-2 array is flat (1 to 1 swr) from 21.050 MHz to 21.400 MHz. At 21.0 MHz and 21.450 MHz, the swr is about 1.3 to 1. The forward gain is virtually constant across the entire 15-meter band. With the array shown in the photos, no antenna tuner or matching device is used even with solid-state output circuitry in the transmitter.

For the 10-meter array, the stub tubes are spaced 5 inches apart, center to center. Either of two stub types may be used. For the simplest possible adjustments, use the short stub with the fixed-position shorting bar. The 25½-inch length is correct for the center frequency of 28.6 MHz. For a center frequency of 28.4 MHz, the stub should be made 26 inches long. For a center frequency of 28.8 MHz, the stub length should be made 24 inches long. With this stub, it is only necessary to carefully adjust the length of each half of the driven element until a zero reflected-power indication is obtained at test point A or at any half-wave point along the transmission line away from the antenna. To maintain electrical balance in the array, each half of the driven element should be lengthened or shortened by the same amount. The electrical balance of the array can be checked by touching each end of the driven element, in turn, with a fingertip. The swr indicator deflection from zero should be the same when touching either end of the element. The electrical balance of the parasitic elements can be checked in the same manner. It will be found that the director-element tips are

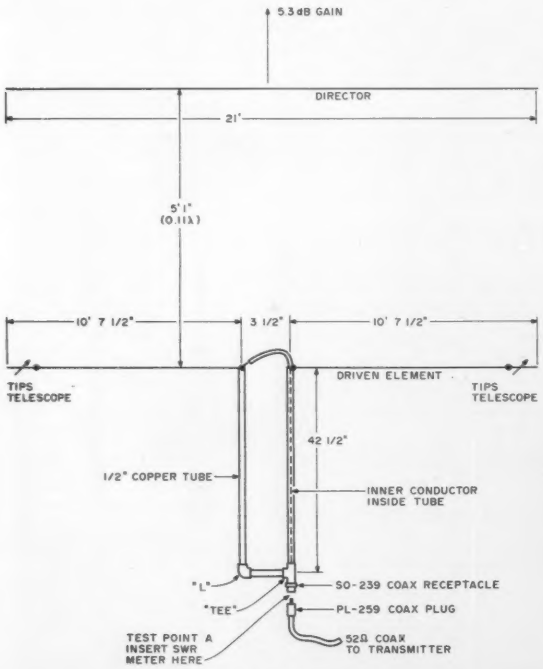


*Fig. 10. 15-meter array.*

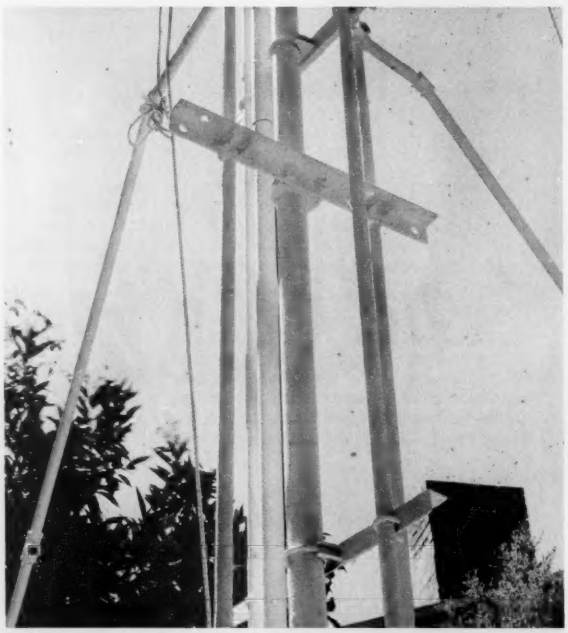

*Photo F. Bracing details.*

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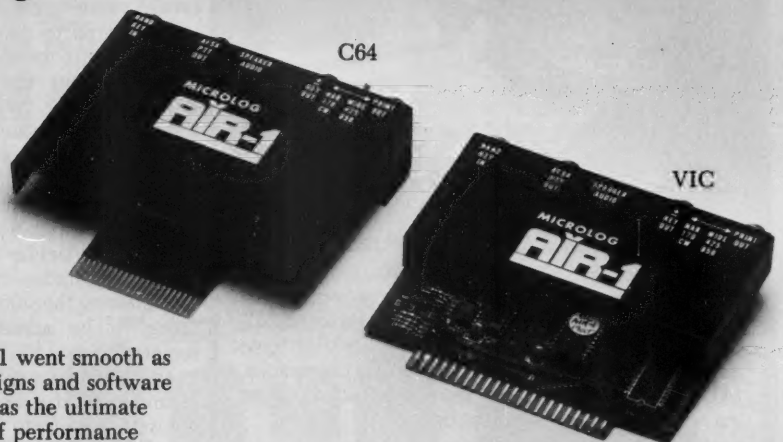


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To start the matching procedure using the long stub, adjust the variable capacitor to about one-half maximum capacitance (about 50 pF). Adjust the driven-element length, tip to tip, to about 16 feet, 5 inches. Make sure each half of the driven element is the same length. Connect the swr meter (bridge) in series with the 52-Ohm line at test point A or at any half-wave point along the line away from the array. To the transmitter end of the 52-Ohm line, apply an unmodulated carrier of 28.6 MHz and about a 5-Watt power level. Adjust the swr meter indicator for exactly full-scale indication in the forward selector-switch position. Change the switch to indicate reflected power. Carefully adjust the length of each half of the driven element until zero reflected power is indicated on the swr meter. After the array has been installed on the tower, the variable capacitor is adjusted to correct any detuning of the driven element when it is removed from the vicinity of the ground. The electrical balance of the array is checked as outlined above. ■


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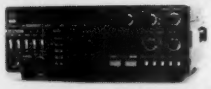

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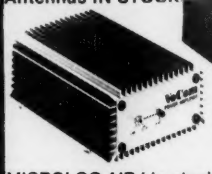

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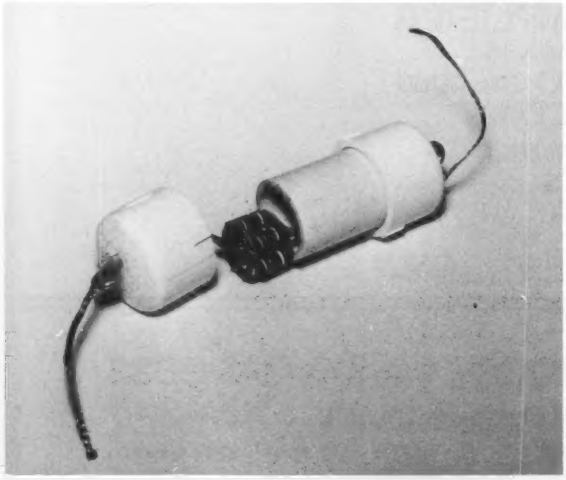
# A Little Gem for QRP

*The T2FD antenna thinks it's a full-size rhombic. Feeding is believing.*

*W. Brandon Randolph W8VFT*
*895 Clifton Road*
*Xenia OH 45385*

While much has been written about antennas in general, little has been published about outstanding radiators for serious QRP work. From reading some of the journals, one would think that QRP is illegitimate unless transmitted from a dipole buried in the basement. Since I do not subscribe to the premise that a second-rate antenna is required to operate QRP, I constructed a QRP version of W3HH's T2FD antenna. This little gem is a real performer, and I would like to share with you the plans for its construction.

For those not familiar with the antenna, a little history is in order. T2FD means terminated folded dipole. This antenna reminds me of a folded-back terminated rhombic. The initial data appeared in *QST* in June, 1949. The next article appeared in *CQ* in November, 1951. *CQ* also published a book called *Antenna Roundup* in 1963. It contained two very informative articles on this antenna.



*The terminating-resistor assembly.*

I constructed one of these antennas prior to the Xenia, Ohio, tornado in April, 1974. I was using a custom-made high-power terminating resistor, and since it could not be replaced, I did not consider rebuilding this antenna after it was destroyed. By the time we moved to the country, I had forgotten how well this antenna performed.

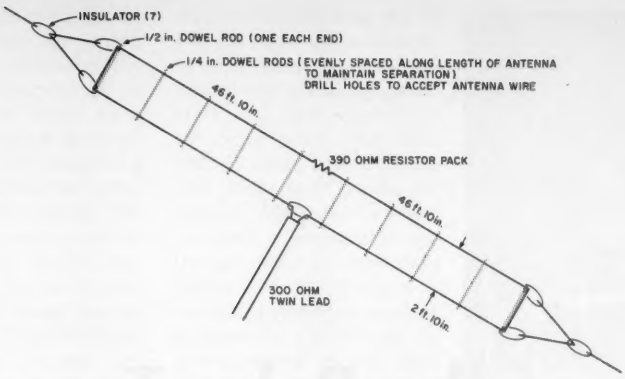
After moving to the country, we installed a wind-powered electric system, and QRP seemed very appropriate. After optimizing our electric system, I was not willing to operate with a second-rate antenna.

After looking through several antenna books, I ran across my old friend T2FD. The terminating resistor has always been the difficult item to obtain. Since I wanted to operate with five Watts, I figured it should be easy to parallel two-Watt carbon resistors for any value I needed. This was the birth of my QRP T2FD.

The antenna is configured as a sloping folded dipole. One end of the antenna is attached at an appropriate height on a tower or pole and the other end can be tied to a fence post or what have you. In the drawing, you will notice that it is fed with 300-Ohm TV-type ribbon. This antenna can be fed with other impedance lines, but it is beyond the scope of this article to cover all possible designs. If 300-Ohm feedline is not acceptable, I would suggest you research the previously-mentioned articles for complete design information. I chose 300-Ohm feedline because it was cheap and readily available.

### Constructing the Terminating Resistor

For 300-Ohm feedline, the terminating resistor is a rather critical 390 Ohms. It just so happens that ten 3900-Ohm, two-Watt resistors in parallel will give us 390 Ohms at a 20-Watt rating. So far, so good. A 1-1/8-inch hole saw will cut two circles in a piece of circuit board faster than I can describe it. These two circles will form the end plates for a resistor cluster pack. Holes are drilled through the board so that three resistors are centered around the middle of the circle. Then the remaining seven resistors are equally distributed around the circumference. This procedure is repeated on the other end plate. When all the resistors are properly aligned with the copper side of the circuit board facing away from the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46 ft. 10 in.
390 OHM RESISTOR PACK
46 ft. 10 in.
300 OHM TWIN LEAD
2 ft. 10 in.

*Fig. 1. 80-meter version of the T2FD antenna.*

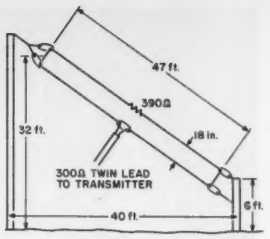



*Fig. 2. 40-meter version of the T2FD antenna.*

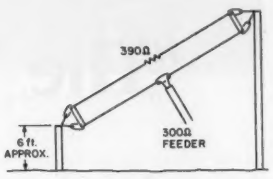



*Fig. 3. Erect the antenna so that the angle of tilt is from 20 to 40 degrees for omnidirectional operation.*

resistors, the assembly may be soldered. The result will be ten resistors wired in parallel.

This resistor pack will now have to be weatherproofed. The following materials will be needed: one piece of PVC pipe 3½" long and 1¼" in diameter; two 1¼" PVC end caps; two screw eyes with lock washers and nuts; two large flat washers that will just fit inside the end caps; two nine-inch-long pieces of ¼" tinned braid; one tube of GE silicone rubber cement; and a small can of PVC pipe cement.

Drill a hole through the center of the pipe caps. Drill a second hole next to this center hole. This second hole is where the braid will come through. Thread the braid halfway through the second hole. Insert the eyebolt through the center hole. Now put the large flat washer inside the pipe cap, bringing the braid out around the inside. Slip on the lock washer and nut and tighten down the assembly. A little silicone rubber cement will waterproof the hole where the eyebolt and braid come through the end cap. Repeat the procedure for the other end cap and allow both ends to dry.

The next step is to trim the braid on the inside of the end caps to the shortest length that can be readily soldered to the copper foil of the resistor pack. Solder the braid of the other end cap to the other end of the resistor pack. Cement both ends of the PVC pipe liberally and shove the assembly together. Allow it to dry while you work on the remainder of the antenna.

**Sticks and Stuff**

Since the antenna is for 80 meters, the total length is a little over 90 feet. Separators must be used to keep the antenna aligned. Eight wooden dowel rods 3 feet long and ¼ inch in diameter will fill the bill. For the end separators, we will need two dowels 3 feet in length but ½ inch in diameter. Five small porcelain insulators will be needed, one for the center and two at each end. Plastic separators would be preferable but wooden dowel rods that have been soaked in oil will weather reasonably well.

The two sides of the dipole must be separated by 2 feet 10 inches. This makes it easy using the 3-foot rods. Measure back one inch from each end and drill your holes. These holes should be drilled before the rods are soaked in oil.

**Bits and Pieces**

The assembly of the wire part of the antenna should be apparent from the drawing. The wire should be cut to the correct length each side of center, and the separators should be threaded on the wire. When this is completed, the center insulator and terminating resistor can be installed. The braid coming through the end caps should be soldered to the antenna wire connected to the eyebolts. This will make a good electrical connection from the resistor pack to the antenna while the eyebolt will take the weight of the antenna off the internal resistors. The 300-Ohm lead-in wire should now be soldered to the center insulator feedpoint.

We are now ready to pull the antenna up into position. It does not matter how the antenna is oriented with reference to the ground. It will probably lie horizontally. This is not important to its operation, but it should slope toward the ground at about a 30-degree angle. This antenna does not require much real estate and should be popular with those living in the city.

Basic design information is included on the drawing in case you may want to scale down this 80-meter version to 40 meters. If constructed as shown, this antenna will operate on all bands from 80 through 10 meters, including the new 30-meter band.

**Feeding the Baby**

The T2FD is best fed with an antenna tuner. Any balanced-output tuner that will match 300 Ohms to 52 Ohms should do fine. I am using a very uncomplicated home-brew tuner with excellent results. QRP can be very challenging and a lot of fun. This antenna will give good results with a minimum of space needed. Good luck, and I'll be looking for you on QRP CW.■

**T2FD Basic Design Data**

1. The length of each leg from the center is equal to 50,000 divided by the lowest desired operating frequency (in kHz) and then multiplied by 3.28. The answer is in feet.

2. The spacing between radiating wires is equal to 3000 divided by the lowest desired operating frequency (in kHz) and then multiplied by 3.28. The answer is in feet.

3. The sloping angle for a nondirectional pattern should be of the order of 30 degrees.

4. The terminating resistor should be noninductive and have a rating equal to 35% of the transmitter input power.

# "The Tops of the Palm Trees"

## *20,000 QSOs. Coral Sea.* Banyandah.

*Harry Mead VK2BJL*
*PO Box 85, Round Corner*
*2158 N.S.W., Australia*

Within the compass of Oceania there are a few DX locations that are rarely visited because of sheer inaccessibility, and they rate highly on the most-wanted lists of amateurs around the world. Mellish Reef is in that category. It is an isolated volcanic peak rising a few meters above sea level from the depths of the Coral Sea, far removed from any shipping lanes and about 600 miles from any habitation—with the sole exception of the small weather crew on Willis Island. Few people have trod the coarse coral sand that hides the volcanic ash and supports vast numbers of gannets and frigate birds who annually nest and raise their young amongst its sparse vegetation. Nor can it be found on any but the most comprehensive maps since it has little significance in any of man's activities.

*The team on Willis Island, with Tony VK9ZH, center.*

Discovered by the British survey vessel *HMS Herald* in 1827 and charted for the admiralty, the major cay inside the lagoon was named Herald's Beacon. The minor cay about four miles north of it remains uncharted to this day, and it is probable that no human foot has ever been set upon its shores.

The late John Martin VK3JW led an expedition of Australian amateurs there in 1973, and I headed an international group of amateurs in 1978 for a second postwar activation of the reef, but by late 1981, Mellish Reef had once more climbed into the top 50 of the world's most-wanted DX locations. After our 1980 expedition to ZM7, Jack Binder KB7NW had gone down to New Zealand for a refit to his ketch *Banyandah* and was due to return to Australia early in 1982. We had been discussing another DXpedition, and one to Mellish Reef was the logical choice after our hopes for a trip to the Kermadecs had been frustrated.

Jack and I held a weekly sked which now was taken up with detailed planning. First, we established a time slot for the operation: It had to be later than the hurricane season and early enough to take advantage of favorable winds. It was also important that we be there during or near the peak of the equinoctial propagation since the sunspot cycle was rapidly on the decline. The cyclones traditionally move north during April and it would be unlikely that we would have one in the Coral Sea after that date, but on the other hand, the equinox was then five weeks past. The favorable wind would continue for several months, so a compromise was made between the two former criteria and we settled on sailing from the mainland during the first week in May. Allowing for a three-day stopover at Willis Island for some CW operation, Jack calculated that the round trip could be accomplished in three to four weeks.

Our next task was to re-

cruit a crew to man the expedition. There are many factors that influence the success or otherwise of an expedition, but none more than the caliber of the team involved. In this respect, it would be hard to find a better group that had all the vital elements necessary to achieve success. Franz Langner DJ9ZB with Bruce Johnson VK3DHT would concentrate on handling the phone section while Fernando Fernandez EA8AK and I would devote most of our operating to CW.

Once the team was established, the logistics were tackled and sponsorship sought. Jack had purchased two Onan generators, two tents, and many of the vital supplies in Hawaii prior to the Kingman Reef and Palmyra Island expedition. They had been purchased after considerable debate as to the most suitable for use under extreme conditions and had served well on KH5 and ZM7. Rigs and antennas would come from our own resources.

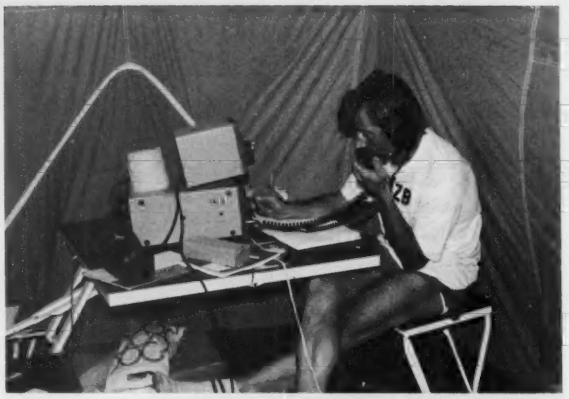
Like all other enterprises, inflation has affected the cost of DXpeditions. Major expeditions are becoming less and less viable; therefore, a substantial donation from the North California DX Foundation was of great assistance to our venture. Nevertheless, the dream of a major annual DXpedition has often gone under from the sheer weight of escalating costs.

We arranged to assemble in Sydney and drive up to Queensland to our point of departure. Fernando had left the Canary Islands early to visit the conventions at Fresno and Dayton and was the first to arrive in Sydney, followed by Bruce a few hours later with Franz arriving the following morning. Jack had taken *Banyandah* up to Bundaberg, and on our final sked before departure asked us to be alongside the dock around noon of the following day so that we could sail on that afternoon tide. He took on fuel, gasoline for the generators, and fresh supplies as we drove north 1500 kms with 25 hours before sailing time (Bruce and I sharing the driving). We gave Franz and Fernando a memorable ride through some of Australia's outback and managed a few hours sleep just north of Brisbane at Caboolture, to arrive almost to the hour alongside *Banyandah* at Bundaberg. With the rigs and antennas stowed aboard, the auto was handed over to be stored in Brisbane awaiting our return. With our personal gear stowed and sleeping quarters allocated, we were ready to sail.

Two hours later we were at the mouth of the river. As the sun began to set and the lights on the shore slowly dropped astern, with sail set and a stiffening breeze we headed out to the edge of the Barrier Reef and the open seas ahead.

The morning of May 3rd saw us clear of the reef on a northeasterly course for Frederick Reef. *Banyandah* was making a steady seven knots in moderate seas, with whitecapped waves rolling along with us, an occasional porpoise rushing across our bows, and flying fish skimming across the troughs of the waves. With only a few puffy white clouds scudding across the sky, star sightings at night and sun shots during the day gave us continual navigation checks and confirmed that we were making excellent time.

Because of the whitecaps, we stood well clear of Samauriz Reef. We looked for the wreck which we had clearly seen on our previous trip, but as we could see the heavy breakers along the reef as we passed along its length, we surmised that she had broken up and disappeared in the intervening years.



*Franz DJ9ZB operating with the TS-520.*

On the third night we saw the loom of the unattended light on Frederick Reef and made a running fix as we passed; it would be our last terrestrial fix before we reached Mellish Reef.

The fourth day out the winds slackened, and by nightfall the sails were flapping idly in the soft breeze. Jack started the engines and took the sail in. With less than sixty miles to go, we felt a little disappointed that the wind had not held to see us right in, even though it would have made little difference. The sun would need to be high in the sky to help us to see our way through the reef, and sailing or motoring, we had time in hand.

At daybreak on May 7th, Jack waited for the sun to get high enough in the sky to get a fix and, having done so, climbed the mast, scanning the horizon for a sign of the reef. That we were not far away was evident by the large number of sea birds wheeling around. Another sun shot, a recheck of the calculation, and we were certain that we were on the correct latitude. Were we east or west of our destination? It was an even chance. We could not wait until nightfall to take star sights; a decision must be made. If it was wrong, we stood to lose a day; if it was correct, we would find the reef while the sun was high and we could go in.

The birds appeared to be coming from the west. If that were so, then the reef lay to the west. We turned westward and once more

*The author operating from the weather station on Willis Island.*

Jack climbed the mast and scanned the horizon; in less than an hour he saw breakers to the northwest about five miles away. A new course was set, hands were shaken, backs were slapped, and smiles wreathed our faces as we peered ahead waiting for the breakers to be visible from deck level.

Judith took the wheel; Jack once again climbed to the masthead and guided *Banyandah* closer to the outer reef, carefully threading the ship between the jagged coral heads, black and menacing just below the surface, until we found the charted boat passage inside the reef. The thin edge of white sand was now clearly visible, and slowly we inched *Banyandah* through the gaps in the coral heads, some of which were now just awash, waving their long fronds like cheerleaders at a ballgame. We steadily closed the distance between *Banyandah* and the shore until, 300 yards out, the coral heads surrounded us on three sides. Engines were stopped, the bow anchor dropped, and we halted. A stern anchor went down, the slack was taken up, and we had arrived.

It was still before noon, so we had many hours of daylight left to get ashore and set up. Jack got the dinghy launched and the outboard fitted, and he set off for the shore with Franz whilst Judith and the rest of the crew brought the rigs and equipment on deck. We followed closely our prearranged plan: I joined Franz ashore and we proceeded to assemble one of the beams. Fernando and Bruce followed and, with Jack, erected the first tent. Very soon we were ready to put the first station on the air. The generator started on the first pull; a quick check of the bands showed 15m and 20m wide open, with a few signals evident on 10m. I tuned up the 901DM, called

*The operating site on Herald's Beacon.*

CQ on 14195, and was answered by VK2DJE; within a minute, a pileup had started. I handed over to Fernando, joined the others in getting the second antenna up, and we got Franz away on 21 MHz. VK9ZR was away to a good start.

With everything squared away, Fernando and Franz settled down to a steady rate of QSOs; Bruce, Jack, and I straightened our backs and took stock of the island. Jack and I were dismayed at the devastation of the island now compared to how it had been during our previous visit. The cay had been swept recently by Cyclone Bernie and most of the hardy foliage that had once spread thinly over the surface of the island had vanished. So had most of the coral sand, leaving the fragmented volcanic ash exposed, littered everywhere with dead and rotting carcasses of birds. We counted over 700 carcasses—probably twice as many had been swept into the sea. Those birds which had survived were still distraught and startled, and as the sun set and for long after, they wheeled and screamed over and around the island like a swarm of starlings scattered by a farmer's gunshot. Where previously it would have been difficult to pick a way between the nesting birds, only the occasional hermit crab disturbed the scene. We were later to learn that wind velocities of 180 mph had been recorded in the area as the cyclone passed through.

The standby rig was set up in the sleeping tent, and to enable the expedition to satisfy prior requests to join some of the DX nets, checks were run to see if two stations running on the same band would cause any problems. Using the 18AVT vertical, results were as we had found in the pre-expedition tests: no cross-modulation or breakthrough was experienced on either station that was sufficient to interrupt the QSO rate of any of the stations, and from that time on three stations were running any time conditions allowed.

We had agreed that the cardinal aim of the expedition would be that every amateur who wanted to work VK9ZR would have equal opportunity, and while the beams were turned in the direction of optimum propagation, directional calls would be made only when the sheer size of the pileups made it impossible to do otherwise. An analysis of the 1978 logs had shown which areas had lost out during that expedition, and all operators were alerted to keep a special ear for those areas. The only dead period, when no propagation was possible on any band, occurred between 1600Z and 2000Z, and although a listening watch was maintained throughout those hours, only a CW rag-chew with ZK1VU resulted.

During our stay on Mellish Reef, Fernando had a bereavement in his family, and I would like to record our thanks to the operators, worldwide, who kept the channel clear while he was passing and receiving traffic back home. When the chips are down, the vast majority of amateurs prove that they are the gentlemen we assume them to be.

By the second day, we had passed the 8000 QSO mark, equipment and generators performed perfectly, the sun shone, and a swim in the lagoon was a welcome refresher. My recollection of previous expeditions gave the impression that the pileups were bigger this time than I had previously experienced, but I could be wrong. Bruce, who was taking part in his first DXpedition, handled his share like a seasoned DXer. 80- and 40-meter propagation was not as good as we had hoped; the number of QSOs on those bands was disappointingly low. Even so, every station we heard made a contact.

On the third day, we received the news that weather conditions were deteriorating; a number of dark clouds appeared in the sky, and in the evening freshening winds blew down one of the beams. No damage was done and it was quickly re-erected. In the process, we discovered metal stakes buried in the sand that were from our 1978 expedition, and one of them served a second term of duty.

We passed our target of 15,000 QSOs on the fourth day and decided, in view of the rising winds and the knowledge that a cyclone was developing to the west of us, that we would close down on the following day. At daybreak we started to dismantle the sleeping tent

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and gradually move the equipment back to *Banyandah*. As the day progressed, we continued to pack up until only the vertical antenna, one generator, and one rig remained. The pileup was still wide and deep as we waited for the last run from *Banyandah* to take us off. A final QSO with WA6ZWE at 0423Z, and the Mellish Reef 1982 expedition was over. Back aboard, the gear was again stowed away securely, anchors were weighed, and *Banyandah* once more picked her way through coral heads towards the open sea. Almost one hour after our final QSO, Herald's Beacon slipped below the horizon and we were setting course for Willis Island.

The second leg of our Coral Sea DXpedition was to provide the excitement of the voyage, for whilst the trip to and the operation on Mellish Reef had gone according to plan and our best expectations were realized, the homeward leg via Willis Island was menaced by Cyclone Domenic and the aftermath right up until we reached the lee of the Australian coast close to Cairns.

The course to Willis Island from Mellish Reef took us close to Magdalene Reef from whence we set a course to approach Willis Island from the southeast. To reach Willis in the forenoon, Magdalene Reef had to be passed during the hours of darkness and spot-on navigation was essential. Many anxious hours had been spent on the previous expedition peering through the darkness for breakers on a moonless night whilst listening for a 2m signal from Bill VK9ZM on which we could take a bearing. This time we had no 2m signal, but there was a waning moon.

The winds had risen to almost 40 knots after we left Mellish, *Banyandah* was lively in the rising swell, and wet tails were the order of the day as the lee rail dipped under and green seas swept into the cockpit. We were running under a reefed mainsail and peaking to 9 knots; Cyclone Domenic was only 400 miles to the east of us and we were getting the edge of its fury. At that stage it was stationary and we anxiously waited to see which way it would move.

*The team: L to R, Fernando EA8AK, Franz DJ9ZB, Harry VK2BJL, Bruce VK3DHT, and Jack KB7NW.*

We did not sight Magdalene Reef; Jack calculated that we had passed it 12 miles to our south when we altered course for Willis Island, and he took in more sail to make sure we did not run down on the reef in the early hours of the morning. The weather crew had promised to put on a navigation light at the top of their radio mast, but we did not see it, and Jack hove to until daylight before continuing on our course.

It was around seven in the morning when we saw the tops of the palm trees on Willis Island. As we came closer, we saw heavy seas pounding on the reef and rolling into the lagoon, and as we moved round the island to find a lee shore in which to make our approach, we could see the weather crew against the white building watching our progress as we cautiously approached the anchorage.

Jack put down two anchors for safety, unshipped the dinghy, and one by one we were transported ashore. Tony VK9ZH welcomed us on landing and introduced us to the rest of the weather-station crew: Arthur the skipper, Athol, and Jerry. We had brought mail and some urgently needed supplies, not the least of which was a replenishment of the beer and cigarette supplies for Jerry, who, in a moment of bravado, had quit smoking and consigned the remainder of his six-months supply to the ocean only to change his mind the following morning. He had spent nearly two months regretting his action whilst he waited for our arrival.

After a hearty breakfast, we each indulged in the luxury of a hot shower (the first since leaving the mainland) before we were offered a space in the operations room to set up our station. The vertical was set up on the lawn outside the main building and the beam used by Tony was put at our disposal. I opened up on 20m CW at 2316Z, several hours earlier than our anticipated arrival. Our original plan had been to stay for 48 hours, but the winds from Domenic remained steady at 40 knots and the seas were even heavier than when we arrived. The tops of the palm trees, bent over in the wind, conveyed the force of the gale.

Conditions on the air had deteriorated, too. Propagation to the east coast of the USA was poor on all bands, and to most of the USA it was only moderately good. There were a couple of short openings to Japan on six meters and a few European contacts on 80m. We explored the island while away from the rig, observing the birds nesting in the same manner we had expected to find on Mellish Reef. Willis Island is also a breeding ground of the large turtles, and the eggs that they had laid on the island were now hatching so that baby turtles were seen scuttling down to the ocean, so small that they nestled cozily in the palm of a hand.

Good rains over the past six months had made the grasses and wild flowers lush and verdant and the buttons of the yellow and violet wild flowers formed garlands around the nests of the sea birds, with their eggs or chicks. They showed no fear of us as we quietly observed them in their habitat. The rains also had replenished the weather station's water supply and the storage tanks were full.

We were impressed by the routine of the weather-station crew in their collection of weather data and dedication to the maintenance of station buildings and environs; the remoteness of their isolation was brought home even more when we saw by the visitors list that fewer than 70 people had called in the past 60 years since the station was established!

As the time of our scheduled departure approached, we watched the weather pattern over the area, hoping for a change. Domenic appeared to be weakening and moving slowly away from us, but the winds still remained a steady 40 knots and the sea was still heavy enough to make the run out to *Banyandah* a hazard.

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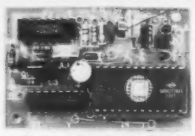

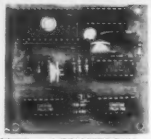

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Added to this, the run from Willis to the mainland was an obstacle course with more reefs and the narrow Grafton Passage through the Outer Barrier Reef. Flights out of Australia had already been booked, however, and Franz and Fernando would incur a heavy financial penalty if they were missed, adding to the burden of an already costly expedition. Naturally, they were anxious to leave according to schedule.

Jack, aware of our predicament, left the decision to us but nonetheless counselled caution and advised us to delay our departure by 24 hours. Arthur, with his access to so much data, consulted the meteorological center in Townsville and added his weight to Jack's advice. A delay of 24 hours would still allow flight connections to be made, but there was no guarantee that the weather would improve; it was at best a 50/50 chance. We bowed to their superior wisdom and settled down to another day of operating.

*Banyandah* had shifted anchorage several times during our stay when anchors dragged or the shelter of the land proved inadequate to the safety of the vessel. Once she lost an anchor which had to be dived for the next day.

When the sun rose on the morning of the 17th of May, the wind was still maintaining its velocity and we decided that we could delay no longer. All the gear was carefully sealed in plastic bags and taken down to the beach. The dinghy raced through the surf and was almost on end as it crashed through the crest of the breakers. Jack had insisted that we wear life jackets, so we were relieved when all of the crew and gear were safely aboard *Banyandah* without damage or a dunking. It took most of the day before everything was stowed away and then, when we were ready to leave, Jack discovered a fouled anchor which required a further hour to clear from the coral shelf under which it had wedged. The sun was setting when we got under way, and with a farewell wave to the group watching us from the shore, we turned our bow away from the island and into the wild seas beyond.

To clear the dangerous areas in daylight, Jack calculated the speed we should make to come up to Swain Reefs during mid-morning, but the winds pushed us along well in excess of that requirement and the light sail was shortened still further to slow us down. Sleep was difficult, but the securest way to be in those high seas was horizontally polarized in our bunks. Calmer seas brought us on deck soon after daybreak, however, and we were in the lee of Swain Reefs. Inside the line of breakers to our north and extending to the horizon, the coral heads loomed dark beneath the surface, picked out by the sandy bottom reflecting through emerald water. On our last trip, there had been a Taiwanese fishing boat high on the submerged coral, her bottom ripped out by the jagged spurs, but like the wreck on Samauriz, there was no trace of her either.

In the calm lee of the reef we dropped anchor and had a hearty breakfast. We had gained several hours on the run from Willis Island and the wind had still not abated. Weather reports were coming in that a change was on the way—that Cyclone Domenic had moved still further east and was dying out. By delaying our departure from Swain Reefs for several hours, *Banyandah* would see the lighthouse on Euston Reef (marking the southern side of the Grafton Passage through the Barrier Reef) in the early morning of the 19th.

Leaving Swain Reefs, we were now moving into the lanes of north- and southbound shipping along the Australian coast, standing well clear of the mighty Great Barrier Reef. Several ships were sighted as we continued our homeward leg and, as Jack had predicted, we sailed past the Grafton light early in the morning. We were awed by the fearsome seas that pounded over the reef, which stretched away to the south as far as the eye could see. We were six hours away from Cairns now; soon Green Island was clearly visible on our starboard bow, and then came the outline of the coastal mountains and the channel leading to Cairns harbor. The harbor master allocated us a berth alongside the main cargo quay; lines went ashore, and with *Banyandah* secured, we relaxed into an emotional scene of mutual congratulations.

Several hours later we saw Franz and Fernando off to the airport; Ray VK2BKD was to meet them in Sydney and entertain them until their homeward flights. Bruce and I stayed on another day unloading the equipment and arranging its shipment down to Sydney, and the following day we flew down to Brisbane, collected our car, and began the long drive back to Sydney. A sack full of QSL cards had preceded us, and now began the long task of checking logs and preparing a QSL card suitable to the occasion.

Between Mellish Reef and Willis Island we had made over 20,000 QSOs to 132 countries on all continents, we had enjoyed the comradeship of a team of operators under difficult and hazardous conditions, and we resolved to undertake another expedition together sometime in the future. ■

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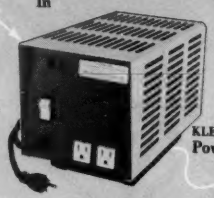


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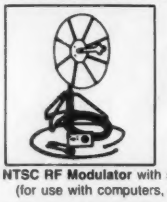

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# How to Gain with PVC

## *This could be history's cheapest quad. Try water pipe on 2m.*

To find out why I need a very portable, high-gain 2-meter antenna, first you must understand a bit of both ancient and recent California history.

About 15 million years ago (an extremely short while, geologically speaking), the Earth groaned and shuddered; huge rock plates cracked together, and the spiny hills known as the Sierra Nevada started to rise 20 to 30 thousand feet into the air. Huge volcanoes resulted from this immense pressure and uplifting, and these 30,000-foot peaks belched smoke and lava, breaking themselves into smaller hills (like Mt. Whitney, "only" 14,000 feet high) and deep valleys, which in time became huge lakes. Lake Tahoe, 6000 feet high and unknown thousands of feet deep, is the result of one of these huge cindercones blowing its top and then collapsing back in upon itself, a classic case of a mountain lake surrounded by peaks many thousands of feet high.

At about this time, Tehama, one of the minor volcanoes of the range, also ex-

*Photo A. The author, with quad mounted on the jeep.*

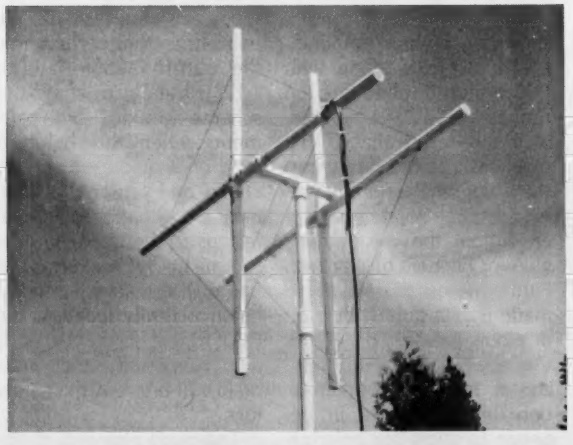

*Photo B. The quad in assembled form.*

*Photo C. The balun attached to the quad driven element.*

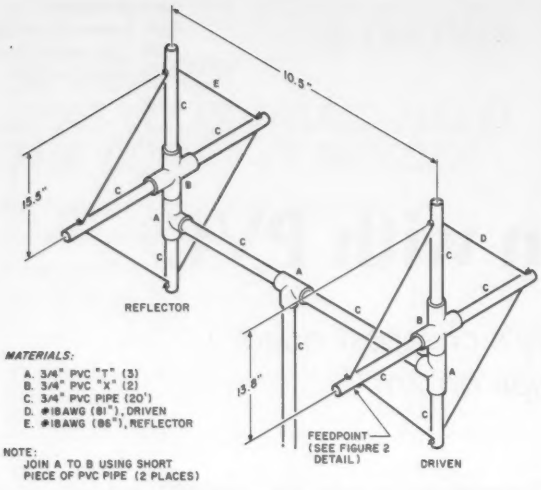


*Fig. 1(a). PVC quad.*

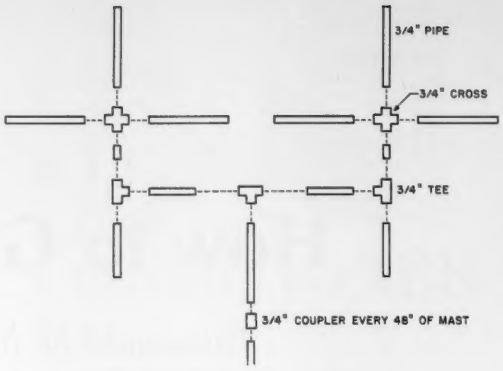


*Fig. 1(b). PVC assembly.*

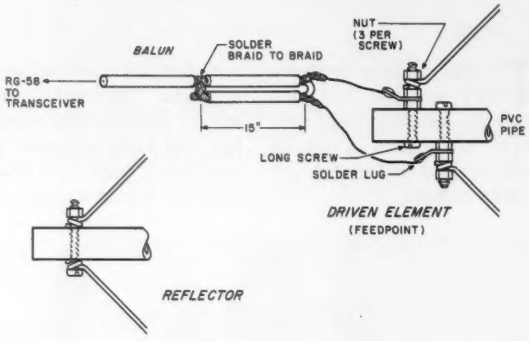


*Fig. 2. Feedpoint and balun detail.*

ploded, creating a secondary volcano called Mt. Lassen. In the process, a deep lake surrounded by peaks, called Lake Almanor, was formed. Later, about a million or so years ago, an earthquake created a crack in the hills surrounding Almanor. The escaping water created the Feather River and its deep canyon.

Now for more recent history. A couple of years ago, a local group of pilots decided to hold a rather unique air race. Instead of merely the fastest being the best, this group decided to award a trophy to the airplane that hauled the biggest load on the least fuel the fastest. They called this 400-mile race the "Competition for Aircraft Fuel Efficiency," since shortened to the CAFE 400.

All of which brings us to the present day. One of the checkpoints in the race is an island in Lake Almanor, and the race folks wanted reports from Almanor back to race headquarters in the Sonoma Valley, some one hundred fifty miles away, preferably on 2 meters. In case you don't get the picture yet, let me paint it in vivid colors: Here I sit on an island in the middle of a lake, surrounded by hills 3 to 4 thousand feet high in every direction, with no ac power, no telephone, and a mission to communicate via 2 meters to another station 150 miles away, which is further tucked into another valley blocked by another mountain range 4500 feet high!

Fortunately, this deck has 3 aces and I drew them all. First, there is a little knoll on this island that will get me up 500 feet above the lake. Second, the Feather River Canyon, although only half a mile wide, is 3000 feet deep, 40 miles long, and pointed directly at Sonoma. Third, Sonoma has a 2-meter repeater on one of those 4500-foot peaks just outside of town.

And the ace up my sleeve (without which we would have lost the game) is my portable quad antenna. 50 Watts and a vertical dipole bought us absolutely nothing, but with the quad antenna described below, signals were Q5 both to and from the lake. See Photo A.

There were some specifications on this quad, though, that made it rather unique. First of all, the entire antenna and mast needed to be disassembled and packed into a bundle of sticks no longer than a meter and a quarter (48"), a size suitable for backpacking (if necessary) a considerable distance. Second, it needed to be put together in 15 minutes or less. Third, of course, it needed to be cheap, cheap, cheap. See Photo E.

I decided to make the entire antenna-supporting structure from 2-cm (3/4") polyvinylchloride (PVC) water pipe and fittings. Photo B shows the general construction details, and Figs. 1 and 2 show construction details of the quad. In working with PVC fittings, I found that the fittings were all tapered, with the result that if the pipe was inserted firmly into the fitting, the assembly was rigid enough to stay together without the use of pins, glue, or keepers of any sort. Furthermore, the joint so made is rotatable with a bit of elbow grease. This allows the quad to go from horizontal to vertical polarization (and anywhere in between to allow for polarization-rotation bounce off the canyon walls) in a few seconds time.

For those of you who have never done any aviation antenna work, the balun shown in Photo C and Fig. 2 may appear strange. Note that the center conductor of the coax does not attach to *anything* at the antenna end, and that the antenna is connected to only the shield braid of the coax. The loss, though, is about 0.1 dB, the balance is near perfect, and the transformation ratio is 1:1. (Note also that this scheme grounds both elements when this balun is used on a dipole—affording cheap and automatic lightning protection.) The balun fastens to the quad element by means of solder lugs. Photo D also shows that the balun is firmly laced to the PVC frame; if the balun is not supported, the coax braid will break at the solder lugs.

The quad elements themselves are AWG 18 wire.

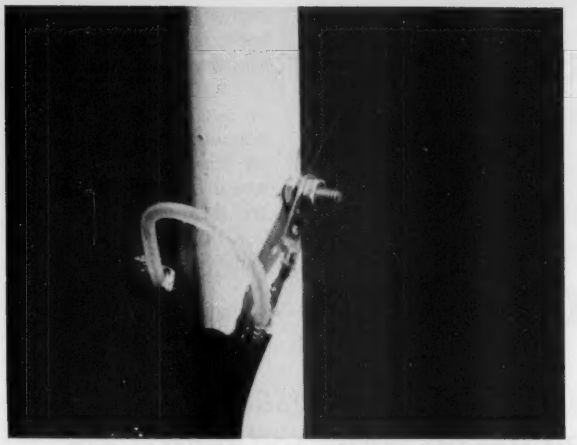

*Photo D. A closeup of the balun attach point.*

*Photo E. The quad disassembled into a box of fittings and a pack of sticks.*

There is nothing sacred about this size; my company uses rolls and rolls of the stuff, so I got it off the shelf. AWG 18 gave us a 1.5:1 vswr bandwidth of about 3 MHz. If you need more bandwidth, use heavier wire.

The proof of any antenna is its gain. While I have not been able to sniggle any free time on the company antenna range for this product, a bit of field testing using a calibrated Kenwood TR-7400 shows the gain of this quad to be between 6 and 8 dB above a reference dipole. The most repeatable measurement indicates a gain of 6.5 dBd. There are many narrow, deep nulls on the backside of the quad, so that a true front-back ratio is hard to define. I *can* comment that a machine in Reno that was giving me fits at Almanor completely disappeared into a null that was measured later in excess of 30 dB. The main beam is fairly wide; eyeball measurements show the 3-dB forward beamwidth to be about 30 degrees wide.

Many thanks to Ron N6AUB and Grover KC7IW for their help in field testing. Also many thanks to the ghost of Mt. Tehama, whose explosion created the need for this antenna. ■


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# Helicoids

*Few people understand how to build these versatile whips. This article takes care of all the ifs, ends, and butts.*

When first employed as a tech rep, I found myself on the move quite often and had a definite need for a portable antenna. I figured that I could kill two birds with one stone and rig up something that I could use in both my job and my hobby, amateur radio.

Sometime in the past, I experimented with a ground-plane antenna utilizing expandable and retractable whips which when simply adjusted to the correct lengths permitted operation on the frequency of choice. Some of you ex-bush monkeys from Southeast Asia ought to remember the 292 ground-plane antenna—a beast to lug around the boonies. Well, at the time, I was trying to come up with a smaller package.

In any case, with that old idea in mind, I decided to try out the same principle in conjunction with helicoidal-type antennas. The main problem was in obtaining a quick disconnect to join the heli form to the whips.

After much fooling around and wasted effort, I decided to use the UHF-type connectors with a barrel in the heli forms and a PL-259/U-type connector on the whip. This called for a much larger heli form which resulted in the antenna being able to handle 500 Watts or more for power with the connectors providing a good solid rf connection.

All in all, it resulted in an antenna that was capable of being used on 21 MHz through 30 MHz with a 500-Watt capability. With the heli form being the largest element in the package (25½ inches), the antenna was what I called suitcase compatible.

## Basic Fundamentals

The use of expandable and retractable whips as capacitance hats helps prove the saying that every little bit helps. The elements also radiate and by virtue of their length provide more capture area for the received signal.

According to the formula for resonance, the frequency is inversely proportional to the square root of either L or C; changing either one would result in a frequency shift. If an inductance value could be found that was compatible with the capaci-

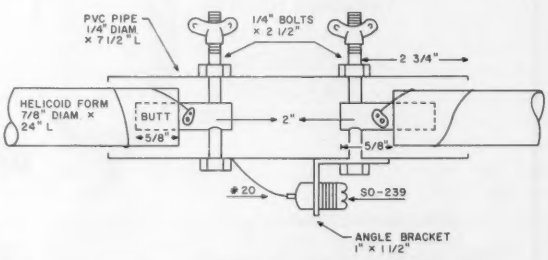
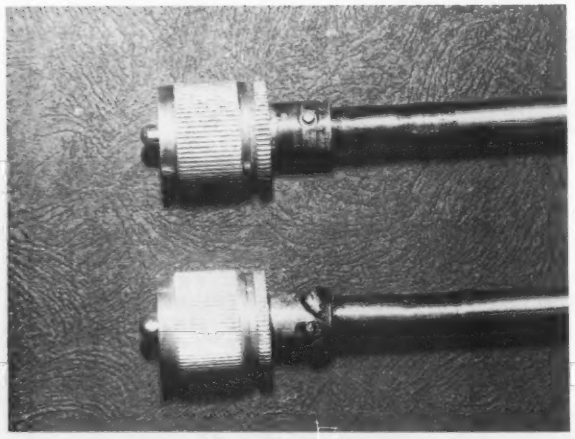



*Fig. 1. Both helicoids mounted within the PVC pipe mount. The two wing nuts are used for mounting to the phenolic mast mount.*



*Harada whips joined with the UC-273/U connectors.*

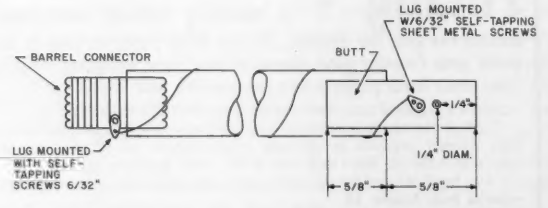



*Fig. 2. The tip and end of the helicoid with the barrel and butt epoxied in place.*

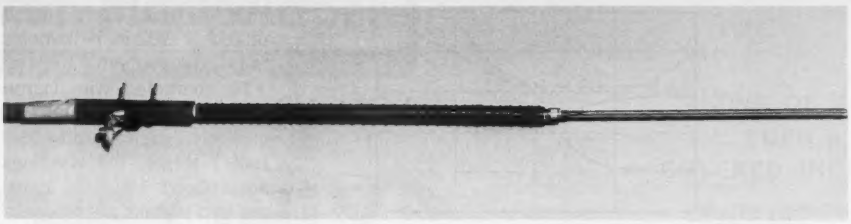
tance value of the whips, then tuning over a specified range of frequencies would be possible.

Armed with that basic research, a suitable induction value was determined by empirical design and found to be compatible with the formulas for induction and the number of turns for a closely-wound coil.

With this, I now had a base frequency to start with. Simply expanding or retracting the whip elements should permit me to tune up to the next highest frequency; a grid-dip meter told me my base frequency was 21 MHz and (much to my surprise and delight) informed me that I could tune on up through 30 MHz.

In any case, before you start construction, let's be realistic: This antenna is not going to compete with any beam or dipole 100 feet up in the air, although I have given some reasonable competition (by logging in 48 countries with these antennas). There is one thing that is certain: You will be able to get a good signal out in what I term a hostile environment.

You will need two sets of whips; I purchased mine from Harada Industries of America for $3.95 each. They are perfect for this application in that they are solidly constructed, are of stainless material, and expand out to approximately 50½ inches. The model number is ST-13 (3TS-1300F) and they are available at most auto supply houses.



*Antenna used as a vertical with the ground side of the helicoid replaced with a radial.*

I needed two additional sets of whips for the 28-MHz-through-30-MHz band, as I didn't want to cut the Haradas—their full length was needed when using the antenna in the vertical configuration. So I used two sets of the conventional type used for FM radio (consisting of three sections, each section 7¾ inches long); these are good as they make good electrical connections when expanded and shortened and give you the frequencies needed if you are concerned with any commercial activities. In any case, I picked up a couple of them in a shopping mall for two bucks.

**Assembly**

Take the two barrel connectors prepared as in Fig. 2 and mount a terminal lug over the 6/32-inch hole; tighten down with a metal screw. Do the same thing with the brass butts.

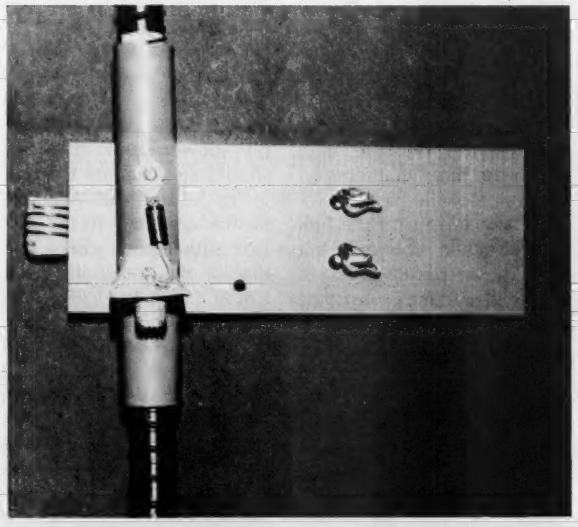
Obtain the two helicoid forms (7/8-inch diameter × 24 inches long); insert the barrel connectors into the form right up to the lug. Using 5-minute epoxy, seal the connectors to the form; repeat with the butts, making sure that their ¼-inch hole is left on the outside.

If the butts and connectors do not conform to the inner diameter of your form, you may have to file the connectors down or wedge them in place. Make sure that you have good solid straight connections.

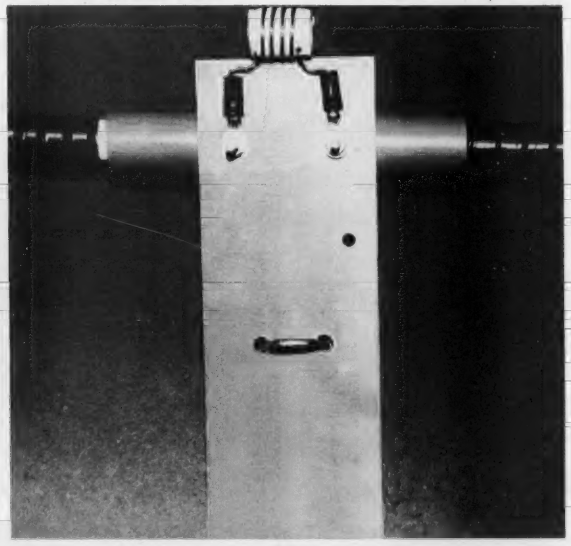
Measure down from the lip of the form on the barrel connector side 4-3/8 inches and scribe a mark; this will be the beginning of the loading coil winding which is simply an extension of the helicoid wire.

Take 133 inches of #20 enameled wire and solder one end to one of the butts. Begin your winding right on the edge of the form, maintaining a ½-inch pitch winding for 16 turns and then a ¾-inch winding pitch until you reach the loading coil mark.

At this point, I suggest taping the winding to keep it in place. Start winding 7 turns close-wound as tightly as possible; on the last turn, I would again use tape to maintain the coils' integrity. Continue the windings up the rest of the form with ½-inch spacing and solder in place.



*PVC pipe with helicoids mounted on either side. Note hole used for tilted dipole.*



*Matching coil mounted on the butt bolts.*

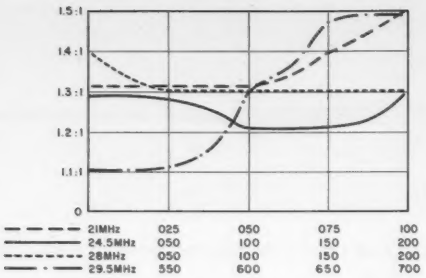



*Fig. 3. Swr curve for antenna used in the dipole configuration and set up 15 feet above ground. Refer to the text for whip lengths.*

You will have to do exactly the same thing with the second heli form, taking care that the winding follows the same axis as the winding of the first form (see Fig. 1).

At this time, I had to prepare the UG-273/U connectors, 4 for each of the whips. I had to break away and remove the plastic that was around the center pin to ensure that when I filled the BNC side with solder, the center pin would be shorted to the main or ground side of the connector's housing.

You should at this time make sure that the inside of the BNC side of the UHF connector is completely clean, as well as the end of the whip which will be inserted into it. Fill the BNC side with hot solder and insert the whip end into it, making sure that you have a good straight connection. When it is cooled, check with an ohmmeter and make sure that the whip, the main housing of the connector, and the center pin are one connection, as this will mate with the barrel connector on the helicoid form.

When I was trying to match up the 50-Ohm coax with the heli dipole, I experienced some problems. At first, I simply hooked the coax directly to the dipole; this would have worked, but I was not entirely satisfied with the swr. I then went to a 7-turn coil shunted directly across the two bolts that held the helicoids to the mast plate. This brought me into an acceptable range, but when I put the swr meter directly into the antenna, my swr was something other than what it should have been. Back to the drawing board.

I finally ended up with a coil with the exact same dimensions as the helicoid; in fact, I used a leftover piece from it. The form is 1 inch long. Approximately 1/8 inch in from each end, I drilled a 3/32-inch-diameter hole. I then wound 4 turns of #20 enameled wire (same that is used on the heli form) and left 2-inch pigtails. (Before I forget, the windings are spaced 1/8 inch apart; the two pigtails are then terminated with ¼-inch spade lugs and the whole affair is smeared with 5-minute epoxy to keep the coils in place and give protection from the elements.) This brought the swr at the antenna input practically down to a flat response with good power output; also, the coil seems to alleviate somewhat the problems of nearby objects having an effect on resonance.

I used a phenolic plate for my mast mount. I took a piece 3½ inches wide by 8 inches long by ¼ inch in thickness. Two inches in from one end, I drilled two holes to match the two bolts that come out of the PVC pipe mount. When the plate is mounted over the bolts, it makes an ideal place in which to mount the coil. About 3 inches down from that, I drilled two more holes for the single U-bolt that would hold the whole affair to some kind of mast.

Last but not least was the PVC pipe mount to hold the helicoid forms. I experienced some problems with this because with the wire on the heli forms there was not sufficient room to insert them into the pipe. I simply took a rasp file and filed down the inner diameter on each side of the pipe to provide a secure fit for the heli forms. When you drill the two 2-inch-spaced holes in the pipe, make sure that they are exactly parallel so as to properly align the butts of the heli.

Take one heli form and insert it into the PVC pipe, aligning the butt hole with the hole in the pipe. Take the SO-239 mounted on the bracket and insert the ¼-inch bolt through it into the PVC pipe, on through the butt, and out the other side of the pipe. Tighten it down with a nut and mount the other heli form on the other side in the same manner. Solder a 2-inch piece of #20 wire to the center pin of the SO-239 and terminate the wire with a ¼-inch spade lug. Take the lug and insert it beneath the second heli bolt and tighten it down. This completes the construction of the antenna.

I would recommend tapping the holes for the butts. I didn't have any taps available at the time and I force-fitted the bolts through the brass butts, making my own threads with little difficulty.

At this point, you should have the phenolic plate mounted and the coil secured with the two wing nuts; connect the two Harada whips to the ends of the helicoid.

**Testing**

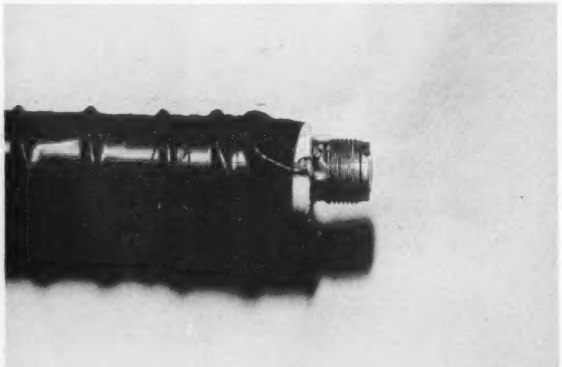
We will not refer to the first section of the whip for adjustments—only the 2nd and the tip "end."

Connect the RG-8/U mini coax; I used 32 feet because that was all I had left and I found it sufficient for my needs.

Adjust the 2nd section for 9½ inches, the tip extended. You can start your checking at a height of 5 feet or 15 feet, whichever is practical for you.

Apply just enough power from the transmitter to establish an swr ratio. It should be rather small. Apply power and the swr should approximate the one in Fig. 3. I used 100 Watts into the antenna. If the swr isn't satisfactory, check the dial of the transmitter and test at a high and low end to determine the whip length.

For instance, if your swr is minimum at 300 kHz and you want, say 50 kHz, extend the whip length about one inch at a time and recheck. I used high-voltage fuse pullers 16 inches long. With a companion for safety and much reduced power, I simply adjusted right in for



*Barrel connector mounted on the end of the helicoid.*

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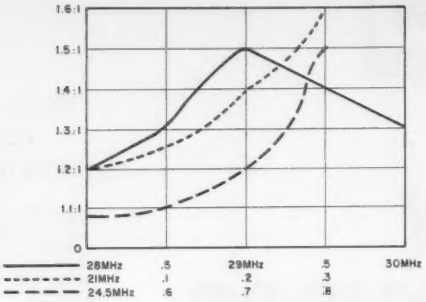



*Fig. 4. Swr curve for one section used as a vertical. Readings were taken at a height of 10 feet. Refer to the text for whip and radial lengths.*

minimum swr. I wouldn't use this method unless highly-trained personnel who know how to react in the event of an emergency are present.

For the 24.5-MHz band, adjust the whip's 2nd section to 3 inches and the tip to 7½ inches; apply the same technique.

For 28 MHz on up, use the FM whips. On 28 MHz, the whip is adjusted for a total length of 19½ inches, using each section.

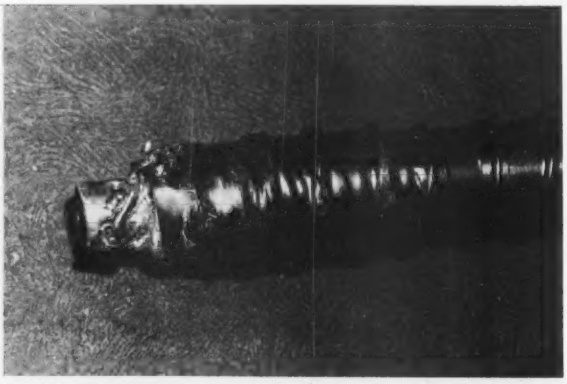
For 29.5 MHz, adjust the whip for a length of 15 inches.

**Testing for the Vertical Mode**

If you say that you don't have enough room to get a heli dipole up in the air, how about a short vertical with one radial ("Great shades of Marconi!"), perhaps mounted on a camera tripod about 3 or 4 feet high, in the living room, out in the yard, or perhaps up in the air about 40 feet?

Well, just remove one heli form from the ground side and make sure to replace the bracket with connector, bolt, and wing nut which will be used to secure the radial.

Hook up the RG-59/U coax (I used 50 feet) and don't forget one Harada whip extended all the way. Connect one radial (10 feet long, about #14 vinyl-jacketed wire) to the wing nut and apply power at 21 MHz. Your swr should approximate the one in Fig. 4. Just let the radial do its thing, lying along the ground or hanging beside the mast. If you find that adjustment is necessary, adjust the radial about ¼ inch at a clip, but tried and proven events dictate that this shouldn't be necessary.



*Brass butt mounted in the helicoid form. Note the threaded hole for rf connector with a ¼-inch bolt.*

On the 24.5-MHz band, adjust the Harada 2nd section to 6 inches, the tip to 7½ inches, and the radial to 9 feet, 6-3/8 inches.

For 28 MHz through 29.5 MHz, adjust the tip only to 6 inches and the radial for 7 feet, ½ inch.

You may want to do as I have done and make up some stubs with phone jacks so that removing one stub will permit resonance on the next highest frequency. This alleviates the problem of carrying around a complete set of radials.

A good swr meter and a noise bridge are really essential for testing. This completes the test for the vertical mode.

**Conclusion**

You shouldn't experience any difficulty in, obtaining resonance with this antenna. I primarily set up all parameters in the low ends of the bands so that there is ample adjustment left to permit operation in your favorite portion of the band.

The swr is sufficiently low so that if I feel like working some SSB, I leave my little Kenwood AT 130 antenna tuner in the line and just touch up a little bit, leaving a complete flat response.

It is a fun antenna to work with, especially when there are 10-meter band openings. I also found it useful for instructional purposes. Being compact, it lends itself to a classroom nicely; a student can have hands-on application in adjusting for resonance, observing swr power relationships, and even trimming the radials.

Most of the parts used in the construction may be substituted for, such as the material for the heli form, the PVC pipe mount, and the coax connectors. You even may want to operate in just one favorite portion of your ideal band. If so, you may replace the whips with something more permanent, such as a piece of brass welding rod or a section of mobile whip antenna. You then will just have to find the correct resonant length for that band.

I have heard a lot of pros and cons with regard to short antennas, ground losses, crunching effect, etc. But I for one have had a lot of fun pursuing my hobby where otherwise I may not have been able to do so.

I would like to make one last comment on the design: The loading coil that I selected is at best a compromise. I could have selected a coil for each band and made the swr as tight as a drum, but this would have entailed changing coils for each band; accomplishing this in the evening, perhaps in the dark, would present problems (dropping a nut, coil, etc.). Changing a whip presented no problem as to selecting the proper length, especially if the elements are grooved so one can touch-sense the correct length for the desired band. In any event, at this time the swr is sufficient for typical operation.

Anyway, some of you antenna buffs should be getting some ideas about a compact beam, maybe a reflector 5% longer with extra optimized spacing. Who knows, it may work.

For you apartment dwellers, you may want to hang the vertical out over the balustrade and put a flag on the end of it.

The most classical approach I have ever seen was undertaken by a friend of mine. He took one of my verticals and had it mounted inside a 2-inch-diameter-by-30-foot piece of PVC pipe; he then mounted a coax connector at the base and just let the radial hang within the pipe. To top things off (as the old saying goes), he then constructed a model TV antenna, spray-painted it with silver paint, and mounted it on top of the pipe to justify the pipe's presence. With that, I'll have to say good luck and 73. ■

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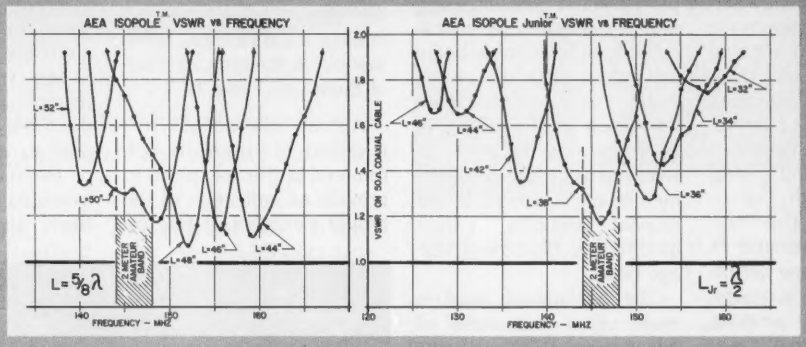


Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station antenna. A standard Amphenol 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole, you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. All IsoPole antennas are D.C. grounded. The insulating material offers superb strength and dielectric properties, plus excellent long-term ultra-violet resistance. All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion resistant aluminum alloys. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is **not supplied**).

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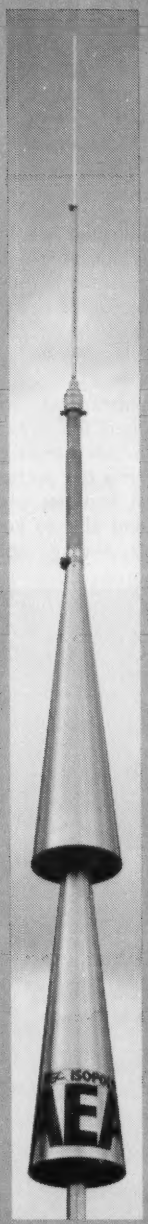

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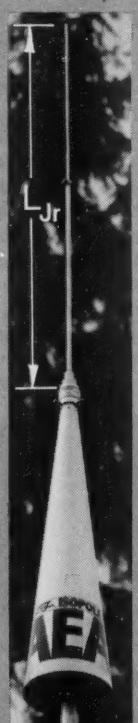


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# The Big-Car Break-Down Beam

*Try two-meter luxury the easy way.*

Involvement with the local RACES/ARES organization (the Radio Amateur Civil Emergency Service/Amateur Radio Emergency Service) prompted a search for a quick-setup beam antenna to enhance two-meter communications when operating from a vehicle at a fixed location. This article describes the beam, mast, and guying that I came up with. The assembly is called "The Four-Minute Beam" because it can be set up by one person in less than four minutes. For two people working together, it's a piece of cake.

The beam selected was a Cushcraft A147-4, a four-element yagi with a boom length of 44" and a weight of only two pounds. The design of this model is ideally suited for the application. It was necessary only to replace the hex nuts with wing nuts to make it a knock-down, quick-assembly beam and add a stack of spacing washers to allow the mounting U-bolt to be pulled up snugly around the small diameter mast. The disassembled beam is stowed in the original shipping carton modified to become a storage box.

The twelve-foot mast is made up of four pieces of telescoping .058"-wall aluminum tubing. The largest is 1-1/8" in diameter, and the longest piece is cut to a length of 56½". The four pieces telescoped are then stowed in the storage box.

Construction of the mast consisted merely of cutting the pieces to length and making a longitudinal hacksaw cut in the ends of three of them. See Table 1.

A small hole (about 1/16") is drilled 14" from the bottom end of the 3/4" piece to provide an indication of the proper extension of the top section when the mast is erected. A stripe of paint or nail polish is easier to recognize, but the hole remains as a reference if the stripe is scraped off as the sections are telescoped.

The stainless-steel hose clamps around the slots in the three outside pieces are used to clamp the sections of the mast together when extended and also to keep them from sliding apart

**Photos by Jim King WB3JZI**

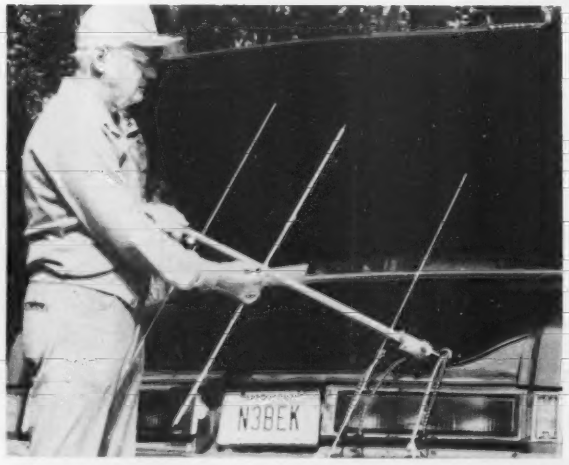


*Photo A. Beam being assembled with wing nuts. No tools required.*

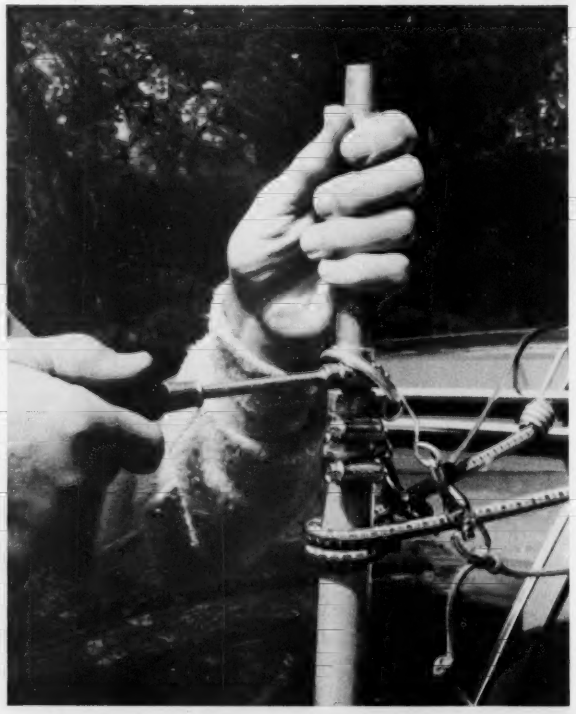

*Photo B. Telescoped mast secured to car. Photo shows hose clamps and guy-line details. Mast is ready for installation of beam.*

*Photo C. Beam and transmission line installed; mast being extended.*

*Photo D. Mast fully extended. Beam being used with HT.*

while being handled. The 1-1/8" piece acts as a stiffener for the bottom section and also allows the beam to be rotated and clamped in the desired direction.

In operation, the mast is secured to the side of the automobile with stretch cords (bungees) with the bottom section resting on the ground. One cord is hooked under the frame, and a second one is hooked to the roof gutter. Two parachute-cord guys are snapped into a hardware ring which is slipped over the top hose clamp. The loose ring allows the mast to be rotated within the bottom outside section of tubing to aim the beam. The guys are secured to the opposite side of the automobile by stretch cords hooked into loops in the guys at one end and under the fenders at the other.

The storage box was made by removing all the staples on the side and end flaps of the antenna shipping carton. The corners were reinforced with pieces of cardboard and the ends were closed with duct tape. The carton is thus converted to a long box with a hinged top cover. The box can be kept closed with a large rubber band around each end.

**Setup Procedure**

The following procedure has been worked out for mounting the beam and erecting the mast on a 1977 Oldsmobile Delta 88.

Prior to field operation, the mast should be erected without the beam to adjust the length of the guys. (See "Field Operation," below.) With the mast extended so that there is a 10" overlap of the first and second sections (the first section consists of the 1-1/8" and 1" pieces telescoped) and the top section is extended to just uncover the market hole (mast height 12 ft.), fasten each guy to a 35" stretch cord and hook one cord on each fender on the side of the auto opposite to the mast.

The rear guy should be hooked at the rear of the wheel to let the guy clear the rear door. Adjust the length of the guys to provide snug guying but not so as to bend the mast. For future rapid setup in the field, tie an overhand knot in a bight in the cords to provide a fixed loop to take the hooks on the stretch cords. Tie a recognizable knot or otherwise mark one cord to distinguish which cord goes to which fender.

**Field Operation**

1) Remove the telescoped mast, the stretch cords, and guy lines from the storage box. Hold the telescoped mast vertically against the side of the auto in the space between the doors (a stiff section of the frame as opposed to the more flexible door panels). A cloth pad between the mast and the side of the car will protect the finish. Near the bottom, take one turn with the short stretch cord around the mast and hook it onto the underside of the frame. Take one turn around the top of the first section of the mast with one of the long stretch cords and hook it onto the roof gutter. The mast will now be held firmly against the side of the car. The cords are just the right length for the Delta 88, but different lengths may be required for other models.

2) Loosen the top two hose clamps. Slide the hard-

| Piece | Diameter | Length | End Slot |
|---|---|---|---|
| 1 | 1-1/8" | 53" | 1" |
| 2 | 1" | 55" | 1" |
| 3 | 7/8" | 56" | 1" |
| 4 | 3/4" | 56½" | none |

*Table 1.*

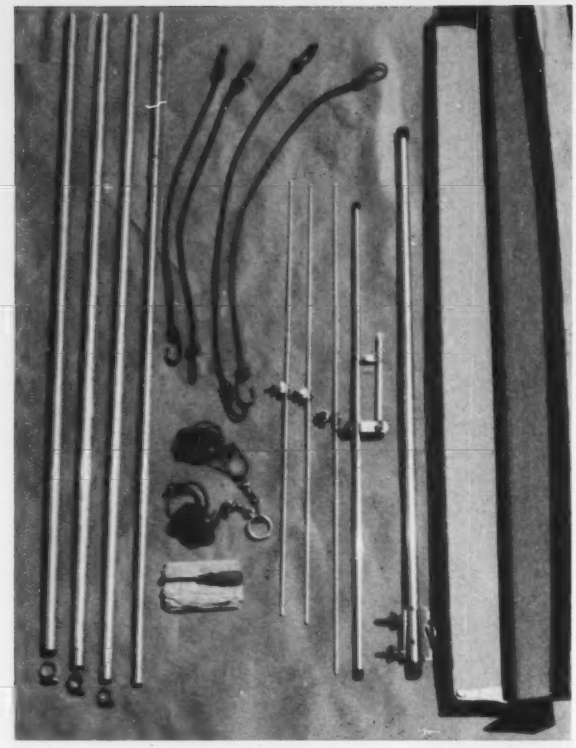

*Photo E. Pictorial parts "list." (See Parts List.) The box on right is storage box made from the beam antenna shipping carton.*

**Parts List**

| | |
|---|---|
| 1 | Cushcraft A147-4, 4-element, 2-meter antenna |
| 4 | 8-32 wing nuts |
| 2 | 1/4" wing nuts |
| 10 | flat washers for 1/4" U-bolt (about 5/16" spacer on each leg of U-bolt) |
| 4 | 6-ft. lengths, .058"-wall, 6061-T6 aluminum tubing (see Table 1) |
| 3 | stainless-steel hose clamps |
| 1 | 1-1/2" hardware ring |
| 2 | small snap hooks, size to fit hardware ring |
| 2 | nylon parachute cords or other small lines about 12 ft. long (cord smaller than about 3/16" is not convenient to handle during mast erection) |
| 3 | stretch cords with hooks, overall length 35" to ends of hooks* |
| 1 | stretch cord with hooks, overall length 28" to ends of hooks* |
| 1 | wood base, approximately 3" × 6" × 5/8" thick (for mast base on unpaved surface) |
| Tool | spin-tite or end-wrench to fit hose clamps |

Total weight in storage box—7¾ lb.

*These are standard sizes at the local hardware store.

ware ring over the top section of the mast. Fasten both hooks onto the ring and throw the two guy lines over the roof of the car. Raise the top mast section about a foot and secure it by tightening the hose clamp.

3) Remove the antenna boom and elements from the storage box and assemble them. Mount the antenna on the top section of the mast and snug the U-bolt by tightening the wing nuts. Connect the coax transmission line to the antenna.

4) Raise the top section of the mast to just uncover the marking hole and fasten it securely by tightening the hose clamp.

5) Extend the middle section so the total height is about ten feet. *Hold the middle section up firmly with one hand and fully tighten the hose clamp. Stand so as to not be under the antenna.* Hook the two remaining stretch cords to the guys and hook the cords under the fenders. While holding the middle section with one hand, carefully extend it until the two guys are pulled up taut but not so as to bend the mast. *Tighten the hose clamp fully.*

6) Loosen the hose clamp at the bottom—the one around the 1-1/8" bottom tube. Aim the antenna in the desired direction by rotating the mast within the 1-1/8" section. Tighten the hose clamp.

7) Pass the coax feedline from the antenna into the car and plug it into the two-meter rig.

You're in business.

*CAUTION:* Do not erect the mast in any location where it could possibly contact electric wires. Use care when handling the mast with the beam installed. If the sections inadvertently telescope, the antenna elements can become lethal spears.

To take the antenna installation down, hold the mast section being lowered *firmly in one hand,* loosen the hose clamp on that section, and then *ease it down with both hands.* Do not let the elements hit into the car roof—very hard on the finish.

The installation described is stable and adequate for limited periods in moderate weather. The erected mast could be strengthened for a longer stay in windy weather by adding a third guy opposite the other two, tied to a cinder block.

One disadvantage of this setup is that when in place, neither door on one side of the car can be opened. This makes it awkward for two people in the front seat. It will probably be most convenient to mount the mast on the driver's side and use the opposite side as the operating position. It is also not convenient to rotate the mast from inside the car. However, the four-element beam has a broad lobe, so it need not be pointed precisely.

**Performance**

With nothing resembling an antenna range or controlled field-strength measurements, an attempt has been made to compare the performance of the beam with that of a 5/8-wavelength mag-mount roof antenna. The equipment used consisted of an Azden PCS-3000 FM transceiver and a coax antenna switch to allow rapid antenna transfer. The PCS-3000 has an LED S-meter. In order to obtain comparative measurements, the incremental signal strength in dB was predetermined for each of the LEDs.

The signal from several repeaters indicated a beam gain of from 10 to 12 dB over the rooftop antenna. One distant repeater that could not be heard on the rooftop antenna was activated with the beam. A simplex test with a station 17 miles distant indicated approximately a 10-dB advantage for the beam on both transmit and receive. With five Watts of output, the signal at the distant station was reported weak and noisy. With the beam, the report was "solid, noise-free copy."

The mast and beam arrangement has proven to be a convenient means of quickly making a significant improvement in communications performance from an automobile in a fixed location. ■

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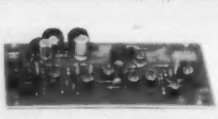

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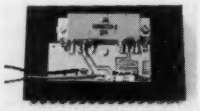

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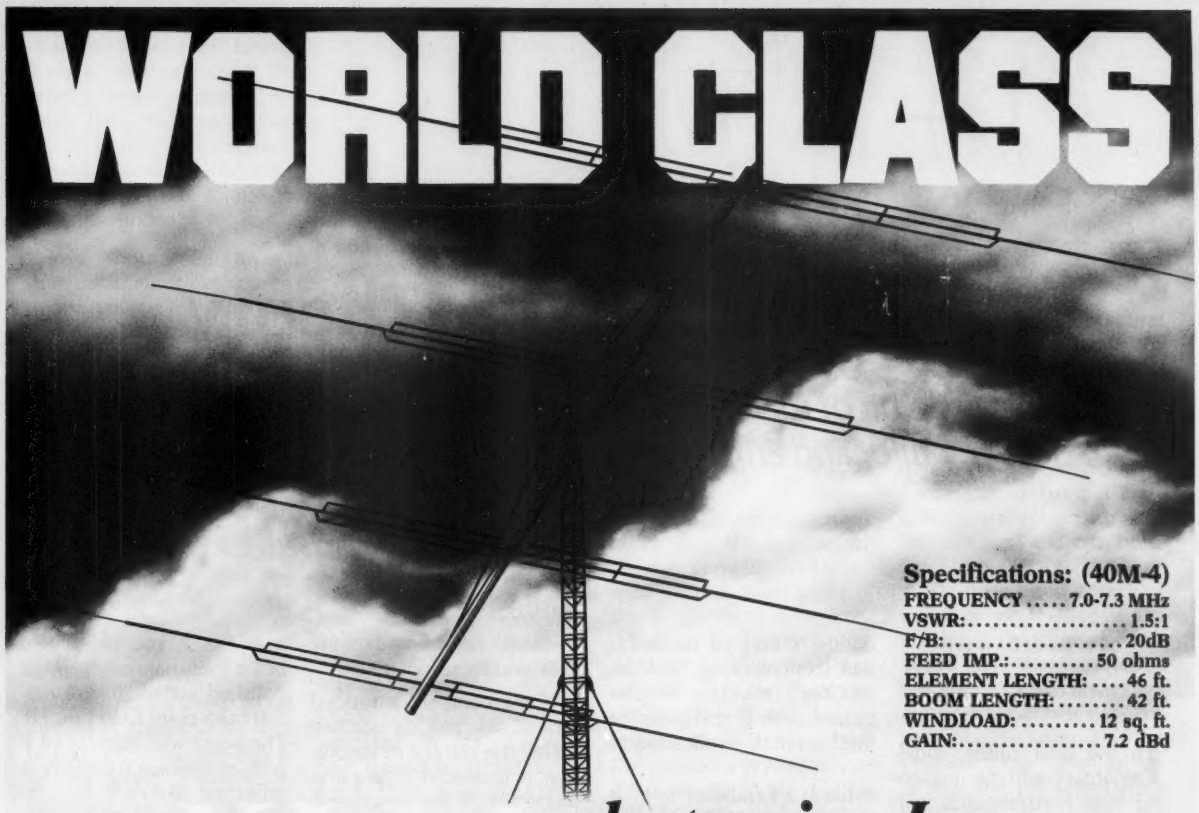

**Specifications: (40M-4)**
FREQUENCY ..... 7.0-7.3 MHz
VSWR: ..... 1.5:1
F/B: ..... 20dB
FEED IMP.: ..... 50 ohms
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WINDLOAD: ..... 12 sq. ft.
GAIN: ..... 7.2 dBd

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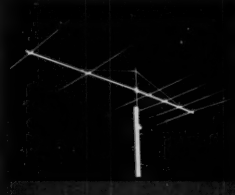

**Specifications: (20M-6)**
BANDWIDTH: ... 13.9-14.4 MHz
VSWR: ..... 1.5:1
F/B ..... 35 dB
FEED IMP.: ..... 50 ohms
ELEMENT LENGTH: .... 37 ft.
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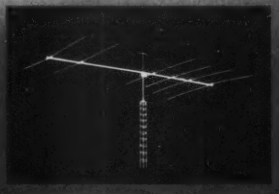
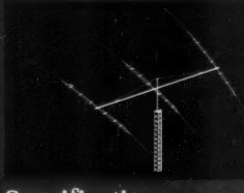


**Specifications: (30M-3)**
BANDWIDTH: ... 10.1-10.150 MHz
VSWR: ..... 1.5:1
F/B ..... 20 dB
FEED IMP.: ... 50 ohms unbal.
ELEMENT LENGTH: .... 35'6"
BOOM LENGTH: ..... 24'3"
WINDLOAD: ..... 7 sq. ft.
GAIN: ..... 7.0 dB

**Specifications: (15M-6)**
BANDWIDTH: ... 21.0-21.5 MHz
VSWR: ..... 1.5:1
F/B: ..... 30 dB
FEED IMP.: ..... 50 ohms
ELEMENT LENGTH: .... 25 ft.
BOOM LENGTH: ..... 36 ft.
WINDLOAD: ..... 8.5 sq. ft.
GAIN: ..... 10.5 dBd



**Specifications: (7.2/10-30-7LPA)**
BANDWIDTH: . 7.2/10-30 MHz
VSWR: ..... 2:1 typical
F/B: ..... 10/15
FEED IMP.: .... 50 ohm unbal.
ELEMENT LENGTH: .... 46 ft.
BOOM LENGTH ..... 42 ft.
WINDLOAD: ..... 12 sq. ft.
GAIN ..... 3/7 dBd typical

# Simple Parabolic Theory

*With a little bit of math—presented here—you can understand, design, build, and enjoy these effective antennas. Hopefully.*

*Luis E. Suarez OA4KO/YV5*
*PO Box 66994*
*Caracas 1061-A*
*Venezuela*

In the near future, radio amateurs will be exploring new horizons that will dramatically enlarge the panorama of our radio activities. High-altitude satellites and frequencies above 1 GHz will be used along with very sophisticated transmitting modes. In contrast, most radio amateurs are reluctant to undertake any project at frequencies above VHF, mostly because of lack of easy-to-read literature. This article is intended to clarify some concepts on parabolic antennas, to help in filling the gap in this area.

The subject is centered on the theory of parabolas and their behavior. The design of reflectors is discussed with a minimum of mathematical implication.

**What Is a Parabola?**

The parabola (paraboloid of revolution) is a curve that theoretically is generated by a point which moves in such a way that its distance from a fixed point, called the focus, always equals its distance from a fixed line, called the directrix. In Fig. 1, D-D′ is the imaginary line called the directrix. C-C′ is the axis of the parabola; it is perpendicular to the directrix. The moving point is P′. If E-P′ = P′-F for any position of P′, then P′ is moving along a parabolic curve. P is midway between directrix D-D′ and focus point F.

If the parabola is rotated around its axis, a surface called the surface of revolution is produced. The same properties of the paraboloid of revolution apply for all the surface of revolution, because of symmetry.

**Energy Reflection**

It is important to know how reflection is produced in a plane in order to understand how the parabolic antenna works. In the next paragraph, I'll explain how the reflection of a light beam is produced. The same criterion should be employed when the energy source is a radio antenna.

In Fig. 2, you see a light beam that is aimed against a polished surface (like a mirror) from point O to point B. The beam will reach point B with an incidence angle $\alpha$. A reflection B-A will be produced and reflection angle $\beta$ will be equal to incidence angle $\alpha$.

Similarly, in a parabola (see Fig. 1), if a tangent to the curve is drawn at any point P1, then the angle $\alpha$ equals angle $\beta$. Thus, if a source of energy is placed at focus point F, its beam is reflected by the parabola surface at point P1 in the direction P1-L. Since P1-L is perpendicular to D-D′, it is also parallel to axis C-C′. The same is valid for all points in the parabola. Thus, a sharp directional beam may be

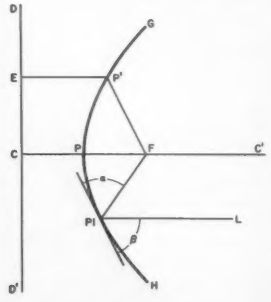



*Fig. 1.*

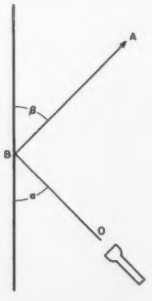



*Fig. 2.*

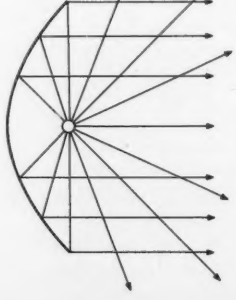


*Fig. 3.*

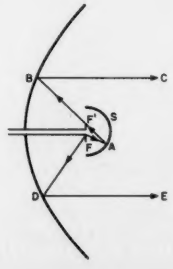



*Fig. 4.*

obtained from a small nondirectional source. But besides the reflected beam, there is also present a diverging beam radiated directly from the source. See Fig. 3. Hence, the resultant wave has considerable scattering unless the source is made directional.

You should be aware that the theoretical source point has no physical dimensions but is spherical in essence. And that a dipole is generally used in practical parabolics and obviously not all parts of the dipole are at focus although most radiation is produced at its center. Thus, defocusing is minimized. The higher the frequency, the smaller the feeding and the better the focusing.

**Second Reflector**

To eliminate the formed divergency beam, a second reflector is used. See Fig. 4. It is a spherical shield, S, mounted surrounding the dipole. It is not parabolic; it is spherical. The shield reflects radiation F-A back to point B. From B, it is finally reflected in the direction B-C. The energy that does not reach the shield will follow the normal path F-D-E as shown in the figure.

The shield should be large enough to surround the dipole and small enough to not obstruct the normal energy path. The shield should have a radius of a value $\lambda/2$ or a multiple of this value. The energy leaving the dipole in the axial direction will be canceled, but this has no importance since most of the energy will make appreciable angle with the axis.

The shield or second reflector actually produces reinforcement because the beam is reflected at A with a 180-degree phase reversal. The total path from F to A and F′ corresponds to a phase reversal of 360 degrees. This, plus the 180 degrees from reflection, makes the beam returning along A-B 180 degrees out of phase, thus producing gain.

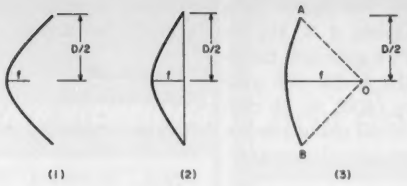



*Fig. 5.*

Instead of the second reflector, a three- or four-element beam could be used with the beam front aimed against the parabola. It is a practical approach for 23 cm and 70 cm but not feasible for microwaves, since horns are much more suitable at millimetric waves.

**Size of Parabolics**

The parabolic reflector is specified by its diameter and the focal distance. In Fig. 5, three types of parabolas with the same diameter and different focal distances are shown. Parabola 2 has the property that $f = D/4$ and parabola 3 uses a directional feed that confines the beam within the angle A-O-B. In this case the shield is certainly not necessary, since very little energy is radiated back from a high-gain antenna. Of course, the antenna is placed so that the beam is aimed against the parabola. In the case of parabola 1, the feeding should not be a directional antenna since the beam would not illuminate the whole reflector, with the consequence of loss of gain. In the case of parabola 3, if a dipole is used, scattering of signal is expected beyond the reflector edge. It is noteworthy that the feed antenna's gain is consequence of the directivity and has no meaning in the overall gain of the parabolic.

It should be noted that for a dipole (Fig. 4), radiation-lobe angle in the plane of the paper is greater than in the plane perpendicular to it. This means that the radiation pattern is not conical. If the dipole is vertically mounted, then the vertical angle will be wider than the horizontal angle. It is expected to be 1.25 times greater.

It is of paramount importance that the beamwidth of the feed be matched with the aperture angle of the parabola as seen from the feed. To determine the distance (f) from the focus point to the parabola vertex (P in Fig. 1), use the formula: $f = D^2/16d$, where D = parabola diameter and d = parabola depth (F-P in Fig. 1). For parabola 2 in Fig. 5, the distance f = parabola depth d. But for parabola 3, the distance f is greater than the parabola depth.

**Cassegrain Parabolic**

The feeding of parabolics is often a cause of divergence or energy scattering that produces undesirable side lobes. The feed structure blocks portions of the parabola and the energy reflected back to the energy source creates standing waves. The above problem, of course, is worse in microwave parabolics that use bulky feedhorns. This is the case when maser or parametric amplifiers are placed very close to the feed. To avoid this problem, a technique known as Cassegrain is used. Cassegrain parabolics are fed from behind the parabola. See Fig. 6.

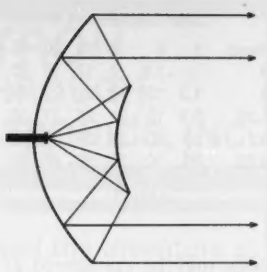


*Fig. 6.*

The main disadvantage of this type of feeding is the aperture blocking introduced by the hyperbolic subreflector used to reflect the energy back against the parabola. To overcome this problem, the feed is extended and the subreflector is reduced in size.

**Parabolic Gain**

The gain of a parabolic depends on its size. Any parabolic antenna may be used at any frequency as long as the feed system (dipole or whatever) is resonant at the chosen operating frequency. The gain is greater when the frequency becomes higher or the parabolic diameter becomes larger. The most important consideration is that the feed should entirely illuminate the surface of the parabola. The efficiency of the para-

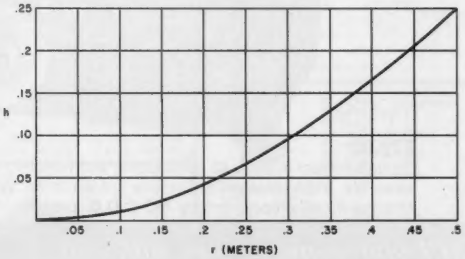



*Fig. 7.*

| | Dish Diameter in Meters | | | | | |
|---|---|---|---|---|---|---|
| **Band** | **1** | **3** | **6** | **10** | **20** | **45** |
| **6** | – | 1.3 | 7 | 12 | 18 | 25 |
| **2** | 1.3 | 10 | 17 | 21 | 27 | 34 |
| **1.25** | 5.4 | 15 | 21 | 25 | 31 | 38 |
| **0.7** | 10 | 20 | 26 | 30 | 36 | 40 |
| **0.23** | 20 | 30 | 36 | 40 | 46 | 53 |

*Table 1.*

bolic may be considered as 55%. Thus: gain over isotropic = .55($\pi$ × diameter/wavelength)$^2$. The parabolic beamwidth is calculated as follows: beamwidth = 137.5/(D/wavelength), where D = parabola diameter.

### Designing a Parabolic Antenna for 23 Cm

Now, let's design a parabolic antenna for 23 cm using a parabolic reflector of 1 meter in diameter. This antenna could be used to work AMSAT Phase III mode L. The gain will be: .55[3.1416(1/.23)]$^2$ = 102; dB gain = 10 log (gain) = 20 dBi.

If a second reflector is used, then the power gain is quadrupled: 4 × 102 = 408. The dB gain will be increased by 6 dB: dBi gain = 10 log (408) = 26 dBi. −1 to −3 dB should be expected in actual construction.

### Reflector Design

The parabolic beamwidth is calculated as follows: beamwidth = 137.5/(D/wavelength) = 31 degrees, where D = parabola diameter.

From the preceding discussion, it is known that the focal length should equal D/4 or 0.25 meters. Then the shape of the parabola is plotted on graph paper from the following equation: $h = r^2/4f = r^2/D$, where h and r are the axial and perpendicular distances in meters to any point P on the parabola. See Fig. 7. For our parabolic, D=1 meter.

The curve is then plotted by calculating various values of r as shown in Fig. 7. This way a template is constructed to which the parabola may be fabricated.

### Mechanical Considerations

Any irregularity in the reflector tends to defocus the beam, increasing the side lobes and reducing both the gain and the beamwidth. The more the surface error, the more the ill effect. A surface error of up to 1/16 wavelength is tolerable. 1/16 wavelength at 70 cm is 4.38 cm and at 23 cm is 1.44 cm. So, at 70 or 23 cm it is very easy to achieve such tolerance. However, this tolerance is proportional to the reflector diameter. A 10-meter reflector would be expected to have surface defects 10 times greater than for a 1-meter reflector. Thus, the smaller the reflector, the more careful its construction should be.

Finally, it is worth mentioning that the lowest practical frequency limit for this kind of antenna is around 100 MHz. Below this frequency, the feed system and the gain-to-diameter ratio are far from desirable.

Table 1 shows the gains (dBi) achieved with several dish diameters for the amateur bands from 6m to 23 cm. In the table you will see that 20 Watts into a parabola of 1 meter (3 ft.) will allow you to reach Phase III mode L with the limit of 2 kW erp, not considering feedline losses. The 6-meter band is shown just for comparison purposes. ■

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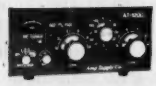

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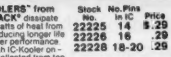

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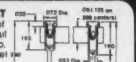

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| 11204 | 18 | .18 | .17 | .15 |
| 11205 | 20 | .20 | .18 | .16 |
| 11206 | 22 | .22 | .20 | .18 |
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| 03305 | 24 | 43.20 | 36.72 | 30.24 |
| 03308 | 40 | 71.98 | 61.18 | 50.34 |
| 03309 | 50 | 89.98 | 76.48 | 62.99 |
| #28 AWG Stranded Flat Cable ("GREY" cable) | | | | |
| 03313 | 14 | $ 28.88 | $ 24.38 | $ 20.08 |
| 03315 | 16 | 33.78 | 27.98 | 22.95 |
| 03317 | 24 | 49.16 | 41.79 | 34.41 |
| 03323 | 40 | 81.94 | 69.65 | 57.35 |
| 03324 | 50 | 102.49 | 87.06 | 71.69 |
| #28 AWG Stranded Color-Coded Cable | | | | |
| 03330 | 14 | $ 43.94 | $ 37.35 | $ 30.78 |
| 03332 | 16 | 50.24 | 42.70 | 35.17 |
| 03334 | 24 | 75.32 | 64.02 | 52.72 |
| 03340 | 40 | 125.52 | 106.69 | 87.86 |
| 03341 | 50 | 156.90 | 133.37 | 109.83 |

**Special of the Month!**

**MCDUTEC BATTERY TESTER**

Tests all batteries ranging from 1.35V to 4.5V.

**Controls:**

3- position switch provides ranges: 1.35-1.5V; 2.7-3.0V; 4.05-4.5V. Durable, pocket size, self-contained. Test leads are permanently attached.

Stock No. 13733 .... $6.95!

**OPCOA**

Single Digit Displays - Common Cathode

| Stock No. | Color | 1 | 100 |
|---|---|---|---|
| 12082 | Red | $1.12 | $ .99 |
| 12085 | Green | 1.84 | 1.63 |
| 12087 | Yellow | 1.92 | 1.70 |
| 12089 | Orange | 2.08 | 1.84 |

Right Angle Socket for Above Displays

| Stock No. | 1 | 100 |
|---|---|---|
| 11010 | $1.24 | $ .99 |

**OPTEL** LCD's with pins

Stock No. 47005

Stock No. 47006

Stock No. 47007

| Stock No. | Description | 1 | 10 |
|---|---|---|---|
| 47005 | 3½ dig, .5" | $ 5.95 | $ 5.50 |
| 47006 | 4 dig, .5" | 5.95 | 5.50 |
| 47007 | 4 dig, .7" | 11.90 | 11.00 |

**The Battery Just Wrap™ Tool**

New battery powered tool wraps insulated wire around .025" square posts without need for pre-cutting and pre- stripping. Complete with bit and 100 ft. 30 AWG wire.

| Stock No. | Description | Price |
|---|---|---|
| 13340 | Battery just-wrap tool with bit and 100 ft. 30 AWG wire | $59.95 |
| 13341 | Replacement bit | 10.35 |
| 13342 | 100 ft. blue replacement wire | 7.54 |
| 13343 | 100 ft. white replacement wire | 7.54 |
| 13344 | 100 ft. yellow replacement wire | 7.54 |
| 13345 | 100 ft. red replacement wire | 7.54 |

**MICRO Charts** - colorful 8½" x 11" charts eliminate the need to stumble through manuals and summaries. Fully decoded - instant access - totally comprehensive - gives pin outs, cycle times, buy notes, etc. etc.

| Stock No. | Reference | Price |
|---|---|---|
| 23010 | Z80 CPU | $5.95 |
| 23011 | 8080A/8085A | 5.95 |
| 23012 | 6502 (65XX) | 5.95 |
| 23013 | 8048 and relatives | 5.95 |
| 23014 | 54/7400 TTL Pinouts | 5.95 |
| 23015 | Basic Algorithms | 5.95 |

**PIN FORMING TOOL**

puts IC's on their true row to row spacing. One side is for .300 centers. Flip tool over for devices .600 centers. Put device in tool and squeeze.

**ONE TOOL DOES 8 thru 40 PINS!**

| Stock No. | Price |
|---|---|
| 11059 | $12.95 |
| 10200 | $14.95 |

Hand Tool
NEW! ANTI-STATIC MODEL

**Scotchflex® Breadboard Systems** Basic kit comes with 24 various Dual Sockets, 40 various Plug Strips, wire and tools. Kit can be used with any of the six boards.

| Stock No. | Description | Price |
|---|---|---|
| 03500 | Basic Kit | $79.95 |
| 03511 | Basic board, 4.5 x 5.5 | 19.50 |
| 03506 | Intel SBC-8010 Board, 12 x 6.75 | 64.95 |
| 03507 | Motorola M-6800 Board, 9.75 x 6 | 42.95 |
| 03508 | S-100 Board, 10 x 5.3 | 36.95 |
| 03509 | Z-80 Board, 7.7 x 7.5 | 39.95 |
| 03510 | Eurocard Board, 6.3 x 3.9 | 21.95 |

**OK MACHINE AND TOOL**

**IC INSERTION/ EXTRACTION KIT**

Includes DIP IC extractors and inserters to accommodate ICs from 14 to 40 pins. Tools that engage conductive surfaces are CMOS safe and include grounding lugs. Stock No. 13309 $41.34

**SOCKET WRAP ID**

DIP socket-sized plastic panels with numbered holes in pin locations. Slip onto socket before wire wrapping to identify pins. Also write on them for location, IC part number, function, etc. Simplifies initial wire wrapping, troubleshooting and repair.

| | |
|---|---|
| 13295 | 14 pin |
| 13296 | 16 pin |
| 13297 | 18 pin |
| 13298 | 20 pin |
| 13299 | 22 pin |
| 13300 | 24 pin |
| 13301 | 28 pin |
| 13302 | 40 pin |
| 13303 | 96 pin |

$1.95 per pack

**LOW PROFILE DIP SWITCHES**

sealed bottom - gold plated

| STOCK NO. | NO. OF POS. | 1-24 | 25 |
|---|---|---|---|
| 10351 | 2 | 1.09 | .95 |
| 10352 | 4 | 1.35 | 1.20 |
| 10353 | 6 | 1.45 | 1.30 |
| 10354 | 8 | 1.50 | 1.40 |
| 10355 | 7 | 1.50 | 1.45 |
| 10356 | 8 | 1.85 | 1.65 |
| 10357 | 9 | 2.10 | 1.95 |
| 19358 | 10 | 2.25 | 2.05 |

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over $250 ... $5.00

# Control Your Mobile Power

*Can commuting be a daily QSO party?*
*Yes, with this no-payment installment plan.*

*Bradley G. Mauger KB5QZ*
*48 F Ridge Road*
*Greenbelt MD 20770*

Mobile operation is one of the most efficient uses of time possible. It allows me and, I am sure, many other amateurs to squeeze some operating into an otherwise too busy day. Almost all solid-state transceivers for any amateur band have been designed with operating mobile in mind and can be powered directly from an automobile's 13.8-volt power system.

Improper care in connecting amateur equipment to this power can cause problems, however, and, in some cases, even damage equipment. No one would knowingly try to operate a 13.8-volt radio from an eight-volt supply or from a supply that had 24-volt spikes on it. But low-voltage conditions can easily occur by having resistance in the circuit used to deliver power to the radio. Many high-power transceivers draw in excess of fifteen Amps while transmitting. Under these conditions, a few tenths of an Ohm can easily drop the supply voltage a few volts. A good, direct path from the battery to the radio should be made to ensure a steady supply voltage. This connection should also be fused for safety.

When we start our cars, nasty things happen to the power system. For one thing, it gets loaded down by the starter's high current demand. The starter, while grinding away to start the engine, can induce huge pulses onto the car's power system. These high-voltage pulses can kill solid-state devices.

*The assembled power controller mounted on the wheelwell in the engine compartment of my car. The relay is held to the plastic sandwich box with double-sided tape, the capacitor is held with a cable tie, and the box is held in place with a single sheet-metal screw which also is the ground point for the relay and capacitor.*

### The Solution

Automobile manufacturers protect their radios and accessories from these starting transients by having a relay or switch connected to the ignition switch that disconnects power from these accessories while the engine is being started. This is why the radio turns off when the car is being started.

The circuit in Fig. 1 is a power-control system I use in my mobile operation. It uses the accessory voltage, which is disconnected automatically during starting, to operate a relay. Only when accessory voltage is present will power be supplied to the amateur gear. The capacitor helps filter out any residual noise and alternator whine.

Other than the accessory voltage wire to the relay coil, all wiring should be #14 or #12 stranded wire. Suitable wire can be found in the automotive department of most department stores.

Finding a place to put the circuit can be a difficulty, especially in today's smaller cars. I built mine into a soft-plastic sandwich box and bolted it onto the fender inside the engine compartment. Wires enter the box through tight-fitting holes. I mounted the fuse holder through a hole in the side where it would be handy and mounted the relay and capacitor to the box with double-sided tape. Fig. 2 shows the layout of my box, although most any layout would work.

### Finding the Voltages

The 13.8 volts coming from the battery should be obtained as close to the battery as possible. Most cars have two leads on the positive terminal, a fat one that goes only to the starter and a thinner one, about a quarter inch in diameter,

that goes to everything else. This thinner one generally goes to a terminal block or a relay. Solder a large terminal lug to the input lead of the power controller and fasten this lug to the same post or connection that the thin battery wire is connected to. Some amateurs connect leads directly to the battery, but because of the corrosive conditions close to the battery, these connections can corrode and lose their good connection.

Finding the proper accessory voltage to operate the relay varies in difficulty from car to car. In my car, the positive wire from the radio was readily available under the dash, so I tapped into the line with a "squeeze" tap connector (Radio Shack 64-3052). If your car does not have a radio or if the radio's power lead is not available under the dash, the power leads of any accessory which automatically turns off during starting will be suitable (e.g., windshield wipers or heater fan). Otherwise, check around the fuse box for such a voltage. Even if your car has no radio, it usually has a fuse dedicated to accessories, and it might even be marked so. Whatever you find, be sure to check the voltage to make sure that it goes away when the starter is engaged.

Most cars have plastic or rubber plugs in the firewall. In order to pass wires from the engine compartment to the passenger compartment, I drill holes in these plugs. Try to make the holes no larger than necessary so that fumes from the engine compartment don't get into the passenger compartment.

**Grounding**

Even if you have a good, solid connection to the positive terminal of the battery, losses can be experienced in the ground or negative side of the circuit. In a car, the negative leg of the circuit is usually the car, its frame, and the body. This is not always sufficient, especially in newer cars.

In order to insulate the cars against sound and to eliminate squeaks and rattles, manufacturers put sound-deadening insulation between metal parts. This material is usually also an electrical insulator. Any current flowing between body parts must then travel though the bolts and screws holding the parts together. These often rust and lose their good connections.

I found this out accidentally by an experience I had with my car. I was having problems keeping a battery charged and had already replaced the battery and solid-state voltage regulator—which was fastened to the fender in the engine compartment. My alternator checked out OK.

One day, after complaining to a mechanic friend, he took his voltmeter out of his toolbox and put the leads between the cases of the alternator and voltage regulator. The meter showed that, while the engine was running, there was over a volt difference between these two grounds. The ground connection of the voltage regulator had so much resistance that it was keeping my battery from being fully charged.

Placing a jumper wire between the alternator and the regulator fixed my low-battery problem. The moral of the story is: Don't trust grounds! Run a good stout ground line from the point the battery's negative terminal connects to the car (usually the engine block) into the passenger compartment, and ground all your equipment.

*The power controller, sealed in the plastic box, takes little room in the engine compartment and keeps the electronics safe, clean, and dry.*

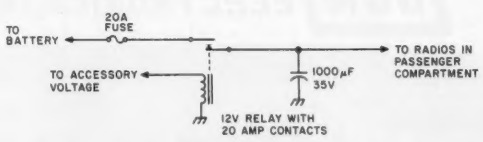



*Fig. 1. Schematic of the power-control box. The capacitor value is not critical, but should not be increased since it would increase the current surge through the relay.*

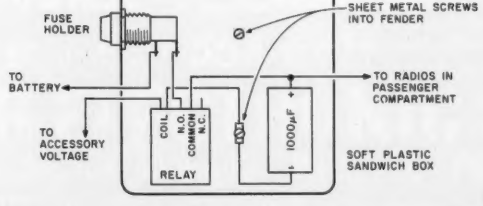



*Fig. 2. The power control box as built into a soft-plastic sandwich box. The fuse holder is Radio Shack 270-367, the capacitor is 272-1019, and the relay is 275-218 with the common and normally-open contacts tied in parallel for increased current. The normally-closed contacts are not used.*

**Temporary Installations**

Sometimes it is not possible to make a permanent installation, as in a borrowed or rented car, for example, or in the spouse's car if your spouse doesn't share your enthusiasm for amateur radio. (My XYL, Mary, has little appreciation for a car full of radios, wires, and connectors. After years of explaining and demonstrating the pleasures of operating and construction, she still calls it CB just to irritate me.) However, generally cars have a cigarette lighter, and a cigarette-lighter adapter is available cheaply that can supply power in a pinch (Radio Shack 270-1534, for example). For VHF and above, magnetic-mount antennas provide a good means of temporarily connecting an antenna.

I have found that it is not a good practice to leave radios sliding around loose on the seat or floor while

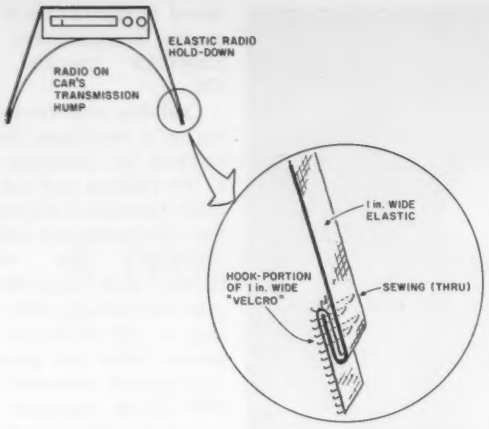



*Fig. 3. An example of a radio mounted to the transmission hump with an elastic hold-down. The radio could be mounted on the side of the hump for better viewing. The insert shows the construction of one end of the hold-down.*

driving. The device shown in Fig. 3 (which my wife refers to as my "bra-strap") can hold a rig firmly to the floor or to the transmission hump. I also use them to hold amplifiers and other accessories to the transmission hump of my car. It consists of the hook portion of a one-inch-wide piece of Velcro fastener sewn to both ends of an eighteen-inch length of inch-wide elastic. The hooks grab firmly into the carpet but can be peeled back off in less than a second. Black elastic and Velcro give a nice, professional look, but any color works.

**Mounting Radios**

A big problem with any mobile installation is that radios should be easy to disconnect and remove from vehicles. A locked door will discourage only a casual thief. I use a two-part mount that is sold for mounting car stereos. These are available at discount houses often for less than five dollars apiece. I bought six identical mounts so that I could mount all my rigs (and have a few spares, of course). I have two mounts in my car and have the remainder bolted to a short bookshelf in my shack. On the radio half of the mounts, I have mounted a ten-meter FM rig, a two-meter rig, a CB, and a cassette deck. Now all my radios fit interchangeably, and it takes only seconds to install or remove gear.

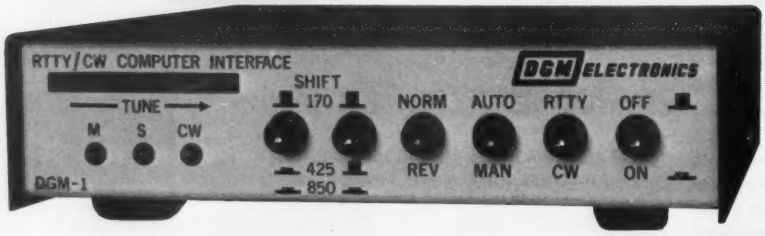
All my antennas have BNC connectors on them and all rigs have adapters to BNC connectors. This helps save time and keeps everything standardized.

The mounts I use have six sliding contacts. I currently use only two, one for power and one for ground, but I plan to use the others for external speakers and a remote mike.

Mobile operation can be a lot of fun, especially if time is spent on a good installation. This includes having good power and ground connections. In any case, try not to leave radios turned on while starting, and *never* transmit while starting. Hope to meet you soon on the air, mobile. ■


NEW! RTTY/CW COMPUTER INTERFACE

from DGM ELECTRONICS, INC.




Model DGM-1

- Mark and Space active filter demodulator with bandpass and post detection filtering. Not a phased locked loop demodulator.
- Copies 170, 425 and 850 Hz RTTY shifts and 800 Hz CW tone.
- Built-in stable, sinewave AFSK modulator and FSK output.
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- Positive and negative CW keyed outputs.
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- Easily connects to your computer.
- Manual or Auto PTT control.
- Powered by 120 VAC wall transformer (included).
- Attractive aluminum enclosure for superior RF shielding. Size — 7″W x 1½″H x 7″D.
- Made in USA. One Year Warranty.

Send for free information or contact your local dealer.

**787 BRIAR LANE, BELOIT, WISCONSIN 53511 (608) 362-0410**

| HF Equipment | Regular | SALE |
|---|---|---|
| IC-740* 9-band 200w PEP xcvr w/mic | $1099.00 | 949.95 |

***FREE PS-740 Internal Power Supply & $50 Factory Rebate - until gone!**

| | | |
|---|---|---|
| PS-740 Internal power supply | 159.00 | 149.95 |
| *EX-241 Marker unit | 20.00 | |
| *EX-242 FM unit | 39.00 | |
| *EX-243 Electronic keyer unit | 50.00 | |
| *FL-45 500 Hz CW filter (1st IF) | 59.50 | |
| *FL-54 270 Hz CW filter (1st IF) | 47.50 | |
| *FL-52A 500 Hz CW filter (2nd IF) | 96.50 | 89.95 |
| *FL-53A 250 Hz CW filter (2nd IF) | 96.50 | 89.95 |
| *FL-44A SSB filter (2nd IF) | 159.00 | 144.95 |
| SM-5 8-pin electret desk microphone | 39.00 | |
| HM-10 Scanning mobile microphone | 39.50 | |
| MB-12 Mobile mount | 19.50 | |
| *Options also for IC-745 listed below | | |
| IC-730 8-band 200w PEP xcvr w/mic | $829.00 | 599.95 |
| FL-30 SSB filter (passband tuning) | 59.50 | |
| FL-44A SSB filter (2nd IF) | 159.00 | 144.95 |
| FL-45 500 Hz CW filter | 59.50 | |
| EX-195 Marker unit | 39.00 | |
| EX-202 LDA interface; 730/2KL/AH-1 | 27.50 | |
| EX-203 150 Hz CW audio filter | 39.00 | |
| EX-205 Transverter switching unit | 29.00 | |
| SM-5 8-pin electret desk microphone | 39.00 | |
| HM-10 Scanning mobile microphone | 39.50 | |
| MB-5 Mobile mount | 19.50 | |
| IC-720A 9-band xcvr/.1-30 MHz rcvr | $1349.00 | 899.95 |
| FL-32 500 Hz CW filter | 59.50 | |
| FL-34 5.2 kHz AM filter | 49.50 | |
| SM-5 8-pin electret desk microphone | 39.00 | |
| MB-5 Mobile mount | 19.50 | |
| IC-745 9-band xcvr w/.1-30 Mhz rcvr | $999.00 | 899.95 |
| PS-35 Internal power supply | 160.00 | 144.95 |
| CF5-455K5 2.8 kHz wide SSB filter | TBA | |
| HM-12 Hand microphone | 39.50 | |
| SM-6 Desk microphone | 39.00 | |

*See IC-740 list above for other options (*)

| | | |
|---|---|---|
| IC-751 9-band xcvr/.1-30 MHz rcvr | $1399.00 | 1229 |
| PS-35 Internal power supply | 160.00 | 144.95 |
| FL-52A 500 Hz CW filter | 96.50 | 89.95 |
| FL-53A 250 Hz CW filter | 96.50 | 89.95 |
| FL-33 AM filter | 31.50 | |
| FL-70 2.8 Khz wide SSB filter | 46.50 | |
| HM-12 Hand microphone | 39.50 | |
| SM-6 Desk microphone | 39.00 | |
| RC-10 External frequency controller | 35.00 | |
| CR-64 High stability reference xtal | 56.00 | |
| *Options: 720/730/740/745/751* | **Regular** | **SALE** |
| PS-15 20A external power supply | $149.00 | 134.95 |
| EX-144 Adaptor for CF-1/PS-15 | 6.50 | |
| CF-1 Cooling fan for PS-15 | 45.00 | |
| PS-20 20A switching ps w/speaker | 229.00 | 199.95 |

# ICOM

| *Options - continued* | **Regular** | **SALE** |
|---|---|---|
| CC-1 Adapt. cable; HF radio/PS-20 | 10.00 | |
| CF-1 Cooling fan for PS-20 | 45.00 | |
| EX-310 Voice synth; 745, 751 | 39.50 | |
| SP-3 External base station speaker | 49.50 | |
| Speaker/Phone patch - specify radio | 139.00 | 129.95 |
| BC-10A Memory back-up | 8.50 | |
| EX-2 Relay box with marker | 34.00 | |
| AT-100 100w 8-band automatic ant tuner | 349.00 | 314.95 |
| AT-500 500w 9-band automatic ant tuner | 449.00 | 399.95 |
| MT-100 Manual antenna tuner | 249.00 | 224.95 |
| AH-1 5-band mobile antenna w/tuner | 289.00 | 259.95 |
| PS-30 Systems p/s w/cord, 6-pin plug | 259.95 | 233.95 |
| OPC Optional cord, specify 2 or 4-pin | 5.50 | |
| GC-4 World clock | 99.95 | 94.95 |
| *HF linear amplifier* | **Regular** | **SALE** |
| IC-2KL w/ps 160-15m solid state amp | 1795.00 | 1299 |
| *VHF/UHF base multi-modes* | **Regular** | **SALE** |
| IC-251A* 2m FM/SSB/CW transceiver | $749.00 | 549.95 |

***$50 Factory Rebate - until gone!**

| | | |
|---|---|---|
| IC-551D 80 Watt 6m transceiver | $699.00 | 599.95 |
| PS-20 20A switching ps w/speaker | 229.00 | 199.95 |
| EX-106 FM option | 125.00 | 112.95 |
| BC-10A Memory back-up | 8.50 | |
| SM-2 Electret desk microphone | 39.00 | |
| IC-271H 100w 2m FM/SSB/CW xcvr | TBA | |
| PS-35 Internal power supply | 160.00 | 144.95 |
| IC-271A 25w 2m FM/SSB/CW xcvr | 699.00 | 629.95 |
| AG-20 2m preamplifier | 56.95 | |
| IC-471A 10w 430-450 SSB/CW/FM xcvr | 799.00 | 719.95 |
| EX-310 Voice synthesizer | 39.95 | |
| PS-25 Internal power supply | 99.00 | 89.95 |
| EX-310 Voice synthesizer | 39.00 | |
| HM-12 Hand microphone | 39.50 | |
| SM-6 Desk microphone | 39.00 | |
| *VHF/UHF mobile multi-modes* | | |
| IC-290H 25w 2m SSB/FM xcvr, TTP mic | 549.00 | 489.95 |
| IC-490A 10w 430-440 SSB/FM/CW xcvr | 649.00 | 579.95 |
| *VHF/UHF/1.2 GHz FM* | **Regular** | **SALE** |
| IC-22U 10w 2m FM non-digital xcvr | 299.00 | 249.95 |
| EX-199 Remote frequency selector | 35.00 | |
| IC-25A 25w, 2m, grn leds, up-dn TTP mic | 359.00 | 319.95 |
| IC-25H as above, but 45w.. **(Special!)** | 389.00 | 339.95 |
| BU-1H Memory back-up | 38.50 | |

*Limited Offer!* **Get a FREE BU-1H Memory back-up with your purchase of an IC-25H.**

| | | |
|---|---|---|
| IC-27A 25w 2m mobile transceiver | 369.00 | 329.95 |
| EX-388 Voice synthesizer | TBA | |
| IC-45A 10w 440 FM xcvr, TTP mic | 399.00 | 359.95 |
| AG-1 15 db 440 Mhz preamplifier | 89.00 | 79.95 |
| EX-270 CTCSS encoder | 39.00 | |
| BU-1 Memory back-up | 38.50 | |
| RP-3010 10w 440 Mhz FM repeater | 999.00 | 899.95 |
| IC-120 1w 1.2 GHz FM transceiver | 499.00 | 449.95 |
| RP-1210 10w 1.2 GHz FM repeater | 1199.00 | |
| Cabinet for RP-1210 or RP-3010 | 249.00 | |
| *6m portable* | **Regular** | **SALE** |
| IC-505 3/10w 6m port. SSB/CW xcvr | $449.00 | 399.95 |
| BP-10 Internal Nicad battery pack | 79.50 | |
| BP-15 AC charger | 12.50 | |
| EX-248 FM unit | 49.50 | |
| LC-10 Leather case | 34.95 | |
| SP-4 Remote speaker | 24.95 | |

*Hand-held Transceivers*

| Deluxe models | Regular | SALE |
|---|---|---|
| IC-02A for 2 meters | $ 319.00 | 289.95 |
| IC-02AT w/DTMF | 349.00 | 314.95 |
| IC-04A for 440 MHz | TBA | |
| IC-04AT w/DTMF | TBA | |

| Standard models | Regular | SALE |
|---|---|---|
| IC-2A for 2 meters | $ 239.50 | 214.95 |
| IC-2AT with TTP | 269.50 | 219.95 |
| IC-3A for 220 MHz | 269.95 | 234.95 |
| IC-3AT with TTP | 299.95 | 239.95 |
| IC-4A for 440 MHz | 269.95 | 234.95 |
| IC-4AT with TTP | 299.95 | 239.95 |

| *Accessories for Deluxe models* | **Regular** |
|---|---|
| BP-7 800mah/13.2V Nicad Pak - use BP-35 | 67.50 |
| BP-8 800mah/8.4V Nicad Pak - use BP-35 | 62.50 |
| BC-35 Drop in desk charger - all batteries | 69.00 |
| BC-16U Wall charger - BP7/BP8 | 10.00 |
| *Accessories for both models* | **Regular** |
| BC-25U Extra wall charger for BP2 | $ 10.00 |
| BC-30 Drop in Charger - BP2/BP3/BP4/BP5 | 69.00 |
| BP-2 425mah/7.2V Nicad Pak - use BC30 | 39.50 |
| BP-3 Extra Std. 250 mah/8.4V Nicad Pak | 29.50 |
| BP-4 Alkaline battery case | 12.50 |
| BP-5 425mah/10.8V Nicad Pak - use BC30 | 49.50 |
| CP-1 Cigarette lighter plug/cord - BP3 | 9.50 |
| DC-1 DC operation pak for standard models | 17.50 |
| LC-2AT Leather case for standard models | 34.95 |
| HM-9 Speaker microphone | 34.50 |
| HS10/HS10SB Boom mic headset/switchbox | 39.00 |
| HP-10SA Vox unit for HS-10 | TBA |
| ML-1 2m 2.3w in/10w out amplifier | SALE 79.95 |
| ML-25 2m 2.3w in 20w out amplifier | SALE 179.95 |
| 3A-TTN Optional TT Pad - 2A/3A/4A | 39.50 |
| SS-32M Commspec 32-tone encoder | 29.95 |
| *Marine model* | |
| M-12 12 ch Marine Hand-held | SPECIAL 269.95 |

| *Shortwave receivers* | **Regular** | **SALE** |
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# Virginia's Antenna Farmer

## *From Falls Church comes a simple message to fallow hams: Simple antennas work!*

*Bill Clarke WA4BLC*
*Box 2403*
*Falls Church VA 22042*

This is not just another innovative antenna article. I haven't reinvented the wheel and I shall not ask you to do mind exercises to understand obscure theory, nor shall I dazzle you with exotic physical design. I shall, however, provide the weekend "antenna farmer" with a simple-to-construct, surefire antenna project.

Most new-generation solid-state HF transceivers are designed for instant QSY but suffer severe swr limitations. Hence the need for broadbanded antennas that require no tuning or switching to QSY from band to band.

The antenna I shall describe is fail-safe, will work under even adverse conditions, and has no lossy coils, traps, or stubs. Best of all, it can be designed for any band or bands desired, fed with one feedline, and built in a few hours for only a few dollars.

### Theory

The dipole antenna and various like antennas have been around for a long time. They are the workhorses of most antenna systems, although often hidden within complex design. The dipole is inherently balanced, broadbanded, and easily fed with coaxial cable. It works well on the lower amateur frequencies, giving good general coverage in all directions. It also is quite useful on 20 meters and above but does display some directional characteristics.

Many amateurs, capitalizing upon these characteristics plus the facts that dipoles are light in weight, inexpensive, and easy to install, have never felt a need for towers or directional antennas. Yet these same hams have worked WAS, 5BWAS, DXCC, etc.

### Materials

First, before building the antenna, you must have a feedline to carry the rf from the transmitter to the antenna. I've found, over many years as a ham, that feedlines must reach from the transmitter to the antenna. No more, no less. Excess will only get in the way, and less won't reach. I've never found a need for quarter-wavelength or other measured feedlines.

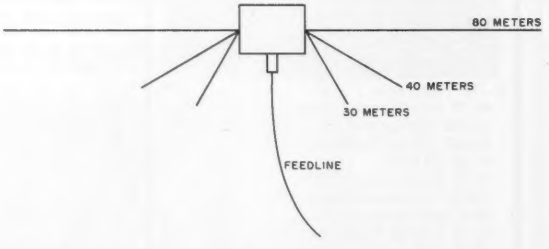
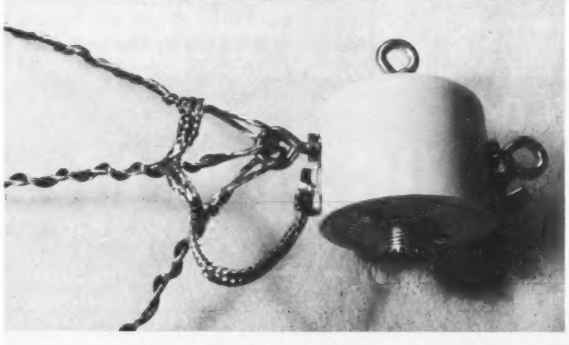



*Fig. 1. Typical 3-band antenna with one feedline.*



*The center insulator with the left side of a 3-band antenna installed. Notice the use of the braid as a flexible connector line from the antenna itself to the center insulator lug.*

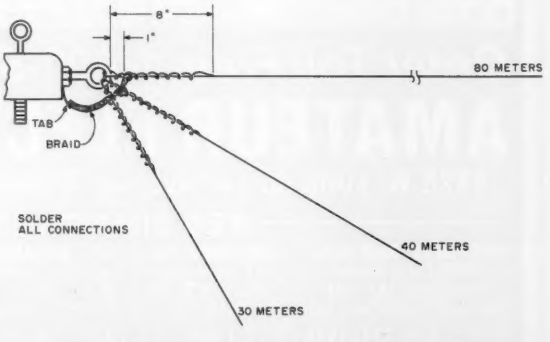



*Fig. 2. Connection of legs to the center insulator.*

The feedline should be RG-58 for output levels under 200 Watts and RG-8 for all others. At frequencies from 160 to 10 meters, these choices will function well and exhibit negligible losses (see Table 1).

Purchase your coaxial cable carefully; if good quality is purchased, you can be assured many years of use. Check the cable for the amount of shielding over the center conductor. Generally, the more shielding, the better the quality. To cut cost corners at this point is to invite trouble in later years with a poorly performing station.

Be sure the PL-259 connectors used on your feedline are installed properly. If in doubt, consult any of the handbooks for examples and guides on their proper installation.

It is a wise amateur who covers his outdoor feedline connectors with a weatherproof sealant. I generally use a silicone glue such as General Electric's RTV product. This will prevent moisture from entering your carefully purchased coaxial cable and avoid the moisture-associated problems of rf loss and high swr, both of which will affect your operation.

The wire for the antenna should be copper, stranded or solid, number 14 or larger, to ensure adequate strength. An alternative, used at this station for years, is galvanized electric fence wire. The latter is available in rolls of ½ mile, size #17, for about $15. You also will need a few insulators, some nylon or poly rope, and a center insulator. I recommend the Van Gorden Engineering HI-Q, at $6.95, available from most amateur outlets.

**Construction**

Table 2 gives the lengths of legs for the various bands of operation. The lengths noted are the distance from the center insulator to the end insulator for each leg. I recommend building this antenna for two to four bands. More than this will result in a clumsy package to handle and install (see Fig. 1).

In constructing your antenna, each leg must be strongly fastened to the center insulator, then soldered to the tab. I have found that a jumper wire from the leg to the tab is the best method, as it allows for flexibility during adverse weather conditions (see Fig. 2).

Each leg must pass through the eye of the center insulator and fold back eight inches. The eight inches is wrapped over the leg itself and soldered. After all legs have been installed in this manner, cut a piece of RG-58 six inches long and strip the braid off. Use this braid as the jumper, wrapping it once around each leg about one inch from the eye, leaving one inch free between each leg and soldering same to each leg. Then solder the free end to the tab.

**Installation**

When construction is completed, you must decide the method of installation—dipole or inverted vee. For inverted vees, the angle between the legs at the apex must never be less than ninety degrees or signal cancellation will result. A height of thirty feet at the apex will be adequate for most general operation. If a dipole is decided upon, the height should be equivalent to the apex of the vee—thirty feet or better.

The longest legs are the highest. All legs must be kept sufficiently above ground level so as to avoid having a shock hazard.

The antenna I use has legs marked with a single asterisk in Table 2 and is operated as an inverted vee. The height of the apex is thirty-five feet, fastened in a handy tree. All legs of my antenna end with a small plastic insulator and are tied to a support at least eight feet above ground level. This keeps the kiddies from coming into contact with the wires.

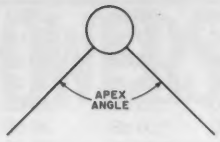



*Fig. 3. Apex angle.*

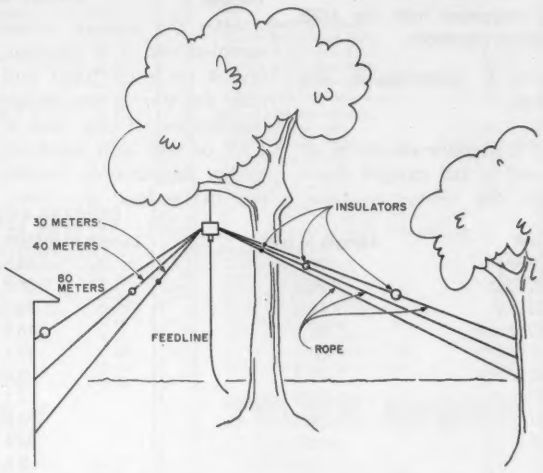



*Fig. 4(a). Typical inverted-vee installation.*

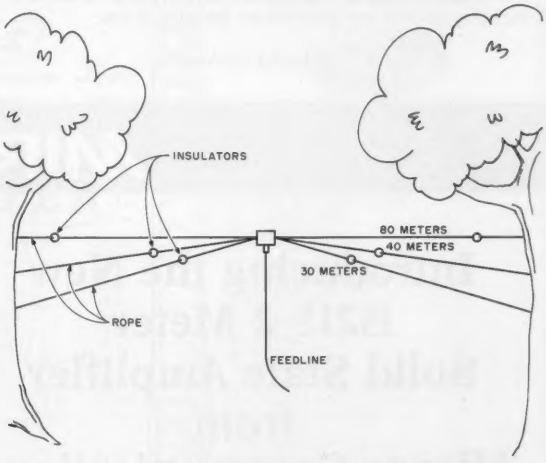



*Fig. 4(b). Typical dipole installation.*

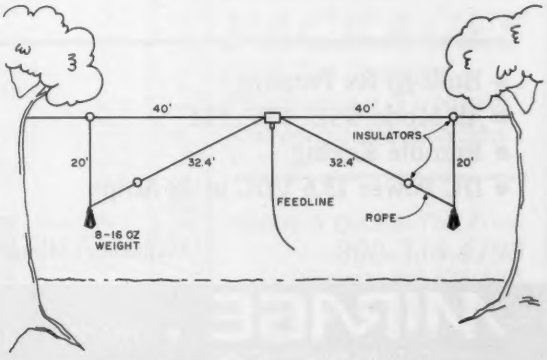



*Fig. 5. Alternative design for limited space.*

| Band | RG-58 | RG-8 |
|---|---|---|
| 160 | .50 dB | .25 dB |
| 80 | .75 dB | .40 dB |
| 40 | 1.00 dB | .55 dB |
| 30 | 1.25 dB | .65 dB |
| 20 | 1.50 dB | .80 dB |
| 15 | 1.80 dB | .95 dB |
| 10 | 2.50 dB | 1.20 dB |

As interpreted from the *ARRL Antenna Handbook.*

*Table 1. Transmission line losses.*

The feedline should be allowed to fall straight down from the center insulator, then led to the station. Try to align the feedline and the various legs to prevent the feedline from running parallel with any of them (see Figs. 3 and 4).

### Testing

After the antenna is assembled and is in position, test it on each band and note the swr at the design frequencies. If the swr is 1.2:1 or less, you need no further adjustments. Should the swr exceed this limit, tune up the band 100 kHz and note the swr, then tune down 100 kHz and note that swr. If the swr is lower *up* 100 kHz, you must increase the length of the legs being tested. If the swr is lower *down* 100 kHz, decrease the length. The adjustments in length must be made equally to each leg of the band being tested or there will be a loss of symmetry. Use adjustment increments of six inches for 160 meters, three inches for 80, two inches for 40 and 30, and one inch for all other bands. Always test and adjust the lowest frequency band first, as this set of legs will be the support for the rest of the antenna.

| Band | Length in feet | Length in meters |
|---|---|---|
| 160 low | 126.5 | 38.6 |
| 160 high | 120.0 | 36.6 |
| 80 CW | 62.6 | 19.1 |
| 80 phone | * 60.5 | 18.5 |
| 40 CW ** | 33.1 | 10.1 |
| 40 phone | * 32.3 | 9.8 |
| 30 | * 23.2 | 7.1 |
| 20 | 16.5 | 5.0 |
| 15 | 11.1 | 3.4 |
| 10 | 8.2 | 2.5 |

* The legs of the WA4BLC antenna.

** Often this set of legs will operate as a 3/4-wavelength antenna on 15, providing you with two antennas for the price of one.

*Table 2. Antenna leg lengths.*

### Alternative Design

An alternative design that will allow operation on 80 and 40 meters in a limited space is built in a similar fashion, but the longest legs, those for 80 meters, are folded and the shorter legs are nested within them (see Fig. 5). This antenna has been a favorite of mine for many years and has given performance equal to any full-size antenna tried at this QTH. Be sure to keep the leg ends at least eight feet above ground level to avoid shock hazard. On the diagram you will notice weights on the ends of the folded legs; these are to keep tension on the wires and keep them straight.

### Conclusion

These antennas give instant QSY for all bands of design with no need for an antenna tuner, which was the original goal, and will provide consistently good contacts. I have worked all states on 80 and 40 meters with these antennas, again attesting to the fact that simple antennas do work, and work well.

Remember safety and keep your antennas clear of all power lines. Happy "antenna farming."■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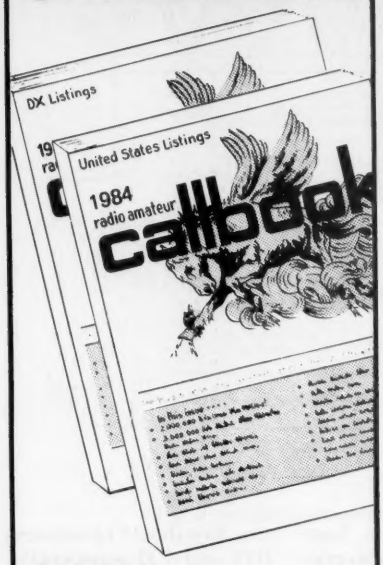


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# Throw in TV

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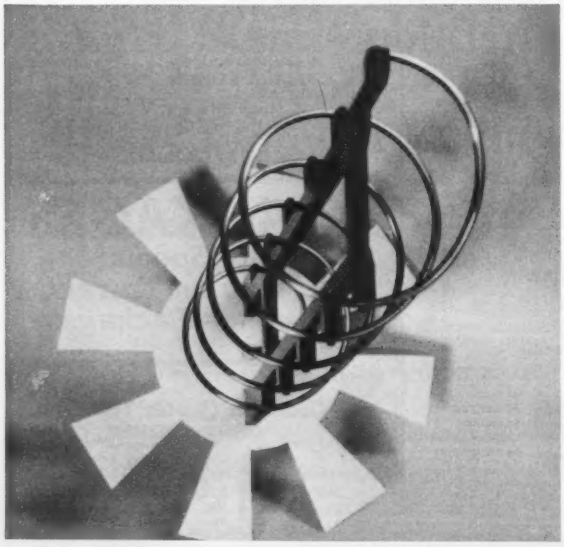
For instance, recently I wanted to build a new antenna to receive OSCAR on 432 MHz. The antenna would be a helix. Helixes are circularly polarized and will reduce fading due to polarization rotation. However, I planned instead to build two antennas—both helical. The first would be for UHF television reception. It would be used to pull in channel 15 for the family television. Because of the wide bandwidth of the helix, reception of channels 27 and 33 would also be improved. The first antenna would serve as a prototype for the second, a satellite antenna. The second antenna was the one I wanted.

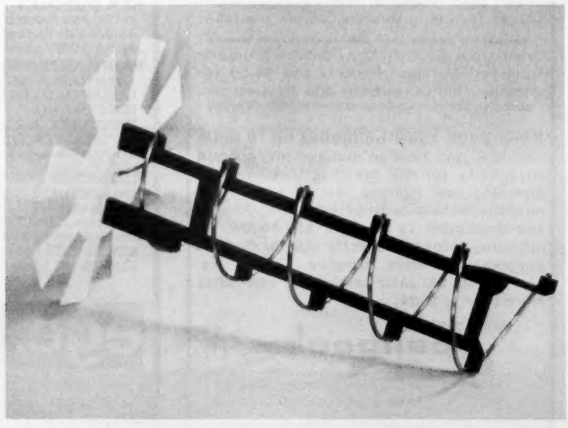
### Design

The design of a helix antenna is straightforward and detailed methods can be found in the literature.[1-3] However, for amateur and entertainment applications, a few simple rules suffice.

First, the circumference of one turn should be between 0.75 and 1.33 wavelengths. For use on a single frequency, a value of 1.0 is used. For the television antenna, I chose a center frequency of 610 MHz. Hence, the circumference of one turn is: C = 300/f(MHz), 300/610 = .49 meters or 19.4 inches. The low-frequency limit is then found by: $\lambda_L = 1.33 \times .49 = .654$m; $f_L = 300/.654 = 459$ MHz. The high-frequency limit is found by: $\lambda_H = 0.75 \times .49 = .369$m; $f_H = 300/.369 = 813$ MHz. The UHF television band extends from 470 MHz to 890 MHz.



*End view of finished 5-turn helix for UHF TV reception.*



*Side view of UHF TV helical antenna. The antenna is right circularly polarized.*

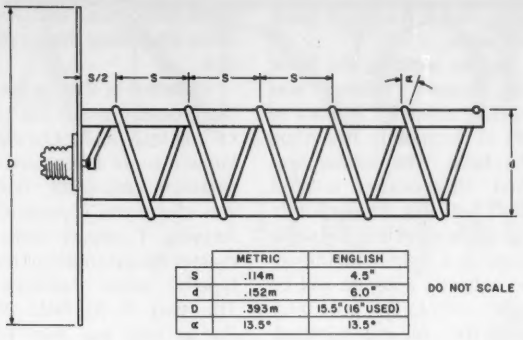



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*Fig. 1. Five-turn right-circularly-polarized helix antenna.*

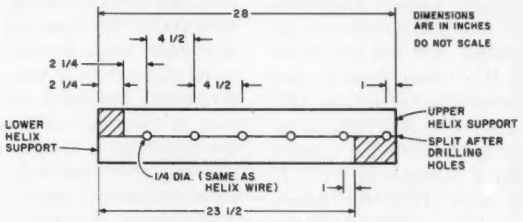


*Fig. 2. Longeron construction.*


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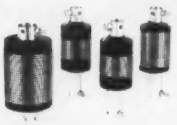

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Don't delay. Call or write today, and we will send you free literature which fully describes our Ham antenna accessory product line.

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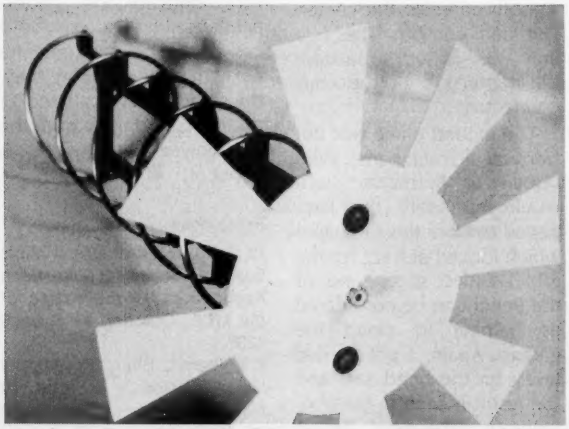
Since our area is restricted to channel 49 or lower, the design is complete. I believe the antenna would work even for higher channels, but you can shift the center frequency to redesign for the higher channels if desired.

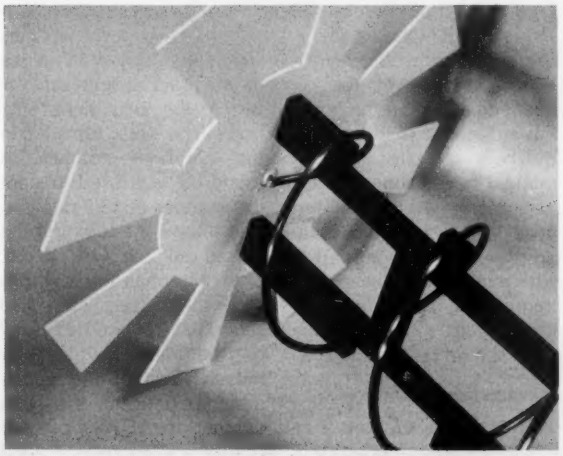
Second, the pitch angle for the helix should be between 12 and 15 degrees. I used a value of 13.5 degrees. Knowing the pitch angle ($\alpha$) and the circumference (C), the turn diameter (d) and the turn spacing (S) are calculated as follows: $d=(C/\pi)\cos\alpha=(.49m/3.14)\cos13.5=.152$ meters=6 inches. $S=C\sin\alpha=.49m\ \sin13.5=.114$ meters=4.5 inches.

Third, the ground plane or disk diameter, D, should be equal to or exceed .8 wavelengths at the design frequency: $D\geq240/f(MHz)=240/610=.393$ meters=15.5 inches (round up to 16 inches).

The final dimensional values are shown in Fig. 1. The diameter of the wire used to wind the helix should be between .005 and .05 wavelengths. For the television antenna, this translates to between 2.45 and 24.5 mm (0.096 and 0.96 inches). Quarter-inch copper tubing works well and looks impressive when cleaned and protected with clear lacquer. How much tubing is needed? Simply multiply C by the number of turns plus one to allow for the start. In this case: $L=C(5+1)=2.94$ meters or about 9 feet 8 inches. Hence, two antennas could be made easily from one 25-foot roll of tubing.



*Rear view showing SO-239 connector and support mounting screws.*

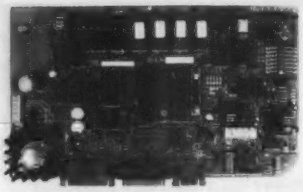


*Close-up of supports and coax connector.*

✓See List of Advertisers on page 114

# TUCSON AMATEUR PACKET RADIO

**Complete Packet Radio Controller Kit!**



- Simple hookup and commands for the newcomer to packet!
- On-board modem designed for optimum performance with standard, unmodified transceivers.
- Retains over 60 user adjustable parameters (including call sign, terminal characteristics, etc.)—even with power removed!
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- Simultaneous operation as packet station and digital repeater—built in!
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- PC board electronically tested to assure quality!

- 200+ page manual with 50 page, heavily illustrated construction section—included!
- Hundreds of TAPR TNCs are in the field NOW!
- For background, see **Ham Radio** (July and August, 1983) and **73 Magazine** (September and October, 1983 and January, 1984)
- Support through **PSR**, TAPR's bi-monthly newsletter serving a membership of over 500 amateurs worldwide!
- Introductory price $240 (plus $10 S&H) in the US and Canada (Arizona residents add 5% tax)
- Manual available separately for $18 (plus $2 S&H) in the US and Canada (manual price creditable towards kit purchase)

**Tucson Amateur Packet Radio (TAPR) P.O. Box 22888, Tucson, AZ 85734** ↩136

(A Non-Profit Research and Development Group)

Prices and specifications subject to change without notice.


After all, you have to buy the tubing for the family antenna. The leftover scrap will make do for your hobby antenna.

The input impedance of a helix can be approximated by: $Z = 140 \times C$(circumference in wavelengths). Hence, for the television antenna, Z varies from a low of 105 Ohms to a maximum of 186 Ohms. If 93-Ohm coax is used, the vswr would not exceed 2:1, However, the impedance is seldom the nominal value and is influenced by how the first turn is made. I have found that for noncritical work, 75-Ohm coax is a reasonable compromise. For antennas used with medium- or high-power transmitters, particularly solid-state units, a matching network should be included.

## Construction

The helix supports, or longerons, were made first. I was able to use a long scrap piece of phenolic material for the supports. Any insulative material could be used, i.e., dried wood, fiberglass, plastic, or bakelite. The helix supports were marked, drilled, and split from a single piece of material as shown in Fig. 2. The holes must be drilled before separating the two pieces. The two supports are separated with two spacers which were epoxied in place to maintain parallelism between the two helix supports. The helix turns sit in the half-hole notches. A round tile was used to slant the notches at 13.5 degrees. This allows the tubing to be seated all the way down. The antenna photographs show the spacers. They also show that I got carried away on the band saw and removed most of the excess material between the helix contact points. All I can say is that it does reduce wind load and weight and looks neat—but it is a lot of needless work.

Before winding the helix, the copper tubing was marked at each C/2 point to aid in accurately mounting the helix. The tubing was then close-wound over a short piece of 5½-inch tubing. If the wind is in the same sense as a right-hand-threaded bolt, the antenna will be right circularly polarized. After the coil was released, the far end was trimmed.

Next, the helix was slid over the support longerons. The trimmed far end was positioned over the last notch on the upper support and clamped, while a hand drill was used to drill through the tubing and into the support with a number 35 bit (6-32 tap size). Then the tubing was shifted over and just the hole in the tubing was drilled out with a 6-32 clear bit. The support piece was tapped and a ½-inch-long 6-32 screw was used to anchor the tubing down.

Turning the antenna over, the next C/2 mark was centered over the last notch on the lower support. As with the end, the tubing and support were drilled, the support tapped, and the two fastened together with a 6-32 screw.

This process was continued until each turn of the helix was firmly secured to the supports. The start end of the tubing was bent in a smooth curve to the centerline and cut off. The free end was drilled to accept the center pin of the coax connector.

The ground plane was cut from an old rack panel. Wire screen or hardware cloth would work well; I just happened to have this old panel which looked perfect for the job. Besides, getting rid of the panel can be considered as helping to clean the garage. Again, I got carried away on the band saw and the result is seen in the photographs. The final design functions as well as a solid disk but is lighter, has less wind resistance, and looks more interesting than a plain disk.

Mounted in the center of the ground plane is the coax connector, an SO-239. I know it is not a constant impedance connector, but it was cheap and it works OK. Anyway, I cannot seem to master the assembly of male type-N cable connectors. The two ¼-20 bolts that thread into the two helix supports and secure the ground plane to the supports are used to fasten the antenna to the mast via an aluminum angle bracket. A word of caution: If you use a chimney mount or mount near a chimney, make sure the antenna is below the chimney port. That way, the exhaust fumes, which are acidic, will bypass your work of art. The antenna will perform longer and will stay cleaner.

A short run of RG-58 connects the antenna to the balun on the television. Running twinlead to a balun at the antenna would gain a couple of dBs, but the extra gain was not needed. For my application, the secondary purpose in building the antenna was to get directivity and a little gain above the local tree line to reduce multi-path fading and flutter. The primary purpose was to buy time to work on a 432-MHz helix. While helping to install the helix, my wife noticed the gutters needed cleaning; maybe I can work on *my* antenna next month! By the way, the gain is between 9 and 11 dB over a dipole and the half-power beamwidth is about 50°. ■

### References


1. John D. Krauss, "Helical Beam Antennas for Wide-Band Applications," *Proceedings of the I.R.E.*, October, 1948, page 1236.
2. William L. Blair, "Putting the Helix to Work," *Radio & TV News*, November, 1958, page 66.
3. Jim Kyle, *VHF Antenna Handbook*, 73, Inc., 1965.

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## Kantronics Software — The Industry Standard

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This program has Hamsoft features with the added ability of communicating in the newest coded amateur format-AMTOR. AMTOR offers error free low power communication. Hamsoft/Amtor is available for the Atari, TRS-80C, VIC-20, and Commodore 64 computers. Suggested Retail $79.95.

### Amtorsoft

For the serious AMTOR operator using a VIC-20, Commodore 64, or Apple computer. This program is similar to Hamtext in capabilities, but can only be used for AMTOR. The Apple version includes both Hamtext and Amtorsoft on one diskette ($139.95), while the Vic-20 and Commodore 64 cartridge is just Amtorsoft ($89.95).

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**Optional mobile bracket** for 940B, 945, 944, $5.00.

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**6 position antenna switch** on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case. 10 x 3 x 7 in.

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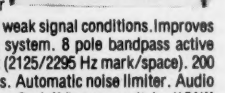


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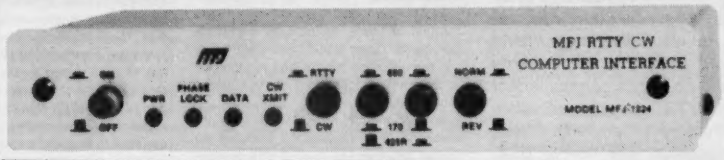


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**New MFJ-1224 RTTY/ASCII/AMTOR/CW Computer Interface** lets you use your personal computer as a computerized full featured RTTY/ASCII/AMTOR/CW station for sending and receiving. Plugs between rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most others.

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**Copies on both mark and space,** not mark only or space only, to improve copy under adverse conditions.

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**Exclusive general purpose socket** allows interfacing to nearly any personal computer with most appropriate software. Available TTL lines: RTTY demod out, CW demod out, CW-ID input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

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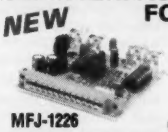

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**4 pole 100 Hz bandwidth active filter.** 800 Hz center frequency. 3 pole active lowpass post detection filter. Exclusive automatic tracking comparator.

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# 73 INTERNATIONAL

*Each month, 73 brings you ham radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.*

*If you would like to contribute to your country's column, write to your country's correspondent or to 73:* Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Jack Burnett.*

## AUSTRALIA

*J. E. Joyce VK3YJ*
*44 Wren Street*
*Altona 3018*
*Victoria*
*Australia*

After the disastrous Ash Wednesday bushfires in 1983, the Victorian State Government set up a Bushfire Review Committee and asked all the relief or emergency services that were involved to submit a report on their activities, plus recommendations for any improvements that these agencies thought would help in any future major disaster.

This, with respect to the role of WICEN (Wireless Institute Civil Emergency Network), was a case of shutting the barn door after the horse had bolted, for efforts had been made six months before the fires to clarify WICEN's position in the event of a major crisis. As a result of these discussions, WICEN was reminded of the vast improvements made in the communications equipment used by authorities in recent years, which meant that WICEN would not be needed except in circumstances such as an earthquake which "topples our antennas."

Just how much the authorities overestimated their communication capabilities in this type of disaster became tragically evident.

In light of the above, the Wireless Institute of Australia (Victorian Division) submitted to the Bushfire Review Committee a comprehensive report on the role that amateur radio, via our WICEN network, played in this emergency. As this report is too long to include in total, perhaps highlighting some of the faults we found in our operational procedure may help other overseas amateur emergency services to avoid the same problems.

Over 200 operators were mobilized or put under standby conditions during the Ash Wednesday period. Of these, only 30 were considered to have had any formal training with WICEN. In the event, the larger amateur population was pressed into service, and they performed very well.

Now to some of the problems. Where the WICEN operators were established at field stations, including relief centers, people did not know who the WICEN person was or where the WICEN camp was located.

People also did not know what was being provided or know how to use the WICEN communication network. They thought we were providing CB radio. These problems were usually solved by an explanation by the WICEN person, but a great deal of suspicion and reserve was still exhibited.

WICEN personnel were not identifiable through uniforms, badging, or identification cards. These would have made passing through road blocks and recognition at the point assigned for radio operations much easier.

WICEN control over movements of its personnel was inadequate because no formal arrangement existed with authorities and no proper provision had been made to cope with tasks which emerged. These included activities of an administrative and management nature, necessary in any well-oiled efficient operation.

Among the shortcomings of WICEN'S internal management was the fact that no formal records were kept of duty hours performed by field operators. This gave rise to situations in which personnel who had been without sleep for more than 24 hours were still volunteering for the next shift or another duty call elsewhere. Even when radio amateurs were ordered off duty, there was no way of checking that they actually did obtain rest.

The facilities at WICEN HQ were totally inadequate, basically because WICEN does not have a permanent HQ as such, with the result that operations were initiated at one radio amateur's home on Wednesday evening and subsequently an operating center was set up at another's garage/workshop which happened to have two telephone lines.

WICEN HQ operated for the first 2½ days with all meals being provided privately. On the third day, a mobile caravan was obtained from the State Emergency Services and placed in an appropriate site in a suburb of Melbourne. Here, personnel were obliged to solicit the aid of local residents in order to obtain toilet facilities, with food and drink still having to come from private sources.

Overall, the WICEN involvement was not only far from being an exercise in snappy message handling, tight net control, and efficient and accurate passing of formal messages, it was a disaster in itself. However, in terms of the provision of field communications in response to all known requests, the operation was a great success. It is considered that WICEN provided a significant contribution to the community.

I personally think that the service we are giving, as seen by others, is just as important as the service we think we are giving. Sometimes we tend to be blinded, within our own organization, by our own sense of achievement or failure.

Bearing this in mind, I feel the following letter of gratitude sent to the Victorian Division of the Wireless Institute of Australia says it all.

**The Order of St. John in Australia**
**St. John Ambulance Brigade**
**Victoria District**

*In the wake of the devastating "Ash Wednesday" bushfires, I would like to place on record the Brigade's deep respect and appreciation for the vital communications links provided by the Wireless Institute Civil Emergency Network (WICEN).*

*There were many occasions during that tragic period when the Brigade's communications facilities were inadequate or rendered inoperative due to terrain peculiarities, traffic congestion, and other difficulties.*

*For the first time ever in a major incident of this magnitude, the Brigade was able to patch into the WICEN communication system with its own unique call-signs—VK3SJA and VK3SJB—adding a new dimension to emergency communication. The important benefits may be summarized in the following three points:*

*1. There were times in the field when communications difficulties were being experienced at the various control centers. These inadequacies in our own system were overcome by using the WICEN link to pass urgent messages to our own Communications Center, which was also part of the WICEN Net. In addition to this, we were able to provide more personnel in the field than would otherwise have been possible due to our limited communication facilities; this deficiency was overcome by attaching a WICEN radio operator to some of our units.*

*2. Perhaps the most important benefit inherent in WICEN is that it provides the ONLY inter-organization communication link in existence. Each organization has its own radio system, but none of these can inter-communicate. It's all very well to say that liaison between organizations must be carried out at headquarters level, but quite often in the field, time is of paramount importance. In our particular case, we found it extremely useful to be able to speedily liaise direct with the Red Cross, the CFA, and the Police on a number of occasions.*

*3. It amazes me at times out in the field just how long it takes for one organization to receive a request or a report from another organization working alongside; this is the classic inter-organizational liaison problem outlined in point 2 above. The advantage of the WICEN Net was further enforced because the Field Control Center was able to monitor WICEN traffic, and therefore: (a) the Brigade was better informed of the overall situation than would otherwise have been the case, and (b) we were able to anticipate requests for assistance from other sources and were thus organized by the time the formal request was received.*

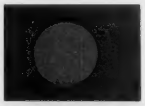
*Like the Brigade, the Wireless Institute Civil Emergency Network is composed of volunteers highly trained for a specific task. The cost to the community of such a dedicated and skilled human resource is incalculable! The hours of training which amateur-radio operators put into their hobby and the wealth of experience gained "on air" would cost millions of dollars annually to emulate in a full-time service. The community at large is indeed indebted to the selfless dedication of the amateur-radio fraternity.*

*It is distressing in the extreme to learn that there is talk in some bureaucratic circles of limiting the ability of amateurs to pursue their hobby of communication and general experimentation by ad hoc and ill-conceived legislation in relation to antennas. Certainly a degree of sanity must prevail in regards to what protrudes into the air or hangs off a chimney! But surely the majority of amateurs are sophisticated enough to know what is socially acceptable in their neighborhood, and the rest I am certain would be only too pleased to reach a compromise.*

*The last thing we need is the intrusion of new legislation in what has traditionally been a self-regulating pursuit. A reasonable sprinkling of towers and antennas is a small price to ask the community to pay in return for a corps of skilled and dedicated enthusiasts who provide an unparalleled, voluntary, emergency service.*

*The Brigade looks forward to a long and rewarding association with the Wireless Institute in general and is always happy to accept the support and assistance of institute members which has so readily been forthcoming in recent times.*

*Yours faithfully,*
***Michael A. Bonacci***



## BANGLADESH

*Saif Shahid, Editor*
BARL Bulletin
*Bangladesh Amateur Radio League*
*GPO Box No. 3512*
*Dhaka*
*Bangladesh*

### ANNUAL GENERAL MEETING

The 1983 Annual General Meeting of BARL was held on December 28, 1983. The agenda included setting up a two-member committee to make an in-depth study of the BARL constitution and suggest amendments and bylaws. The Annual General Meeting also showed satisfaction at the progress made so far regarding issuance of amateur licenses to its members.

A one-minute silence was observed to pay homage to the late Victor Clark. President Saif Shahid gave a short speech mentioning his personal experiences with Vic. His first contact with Vic was in April, 1982, during his visit to the USA. Saif Shahid was surprised at the discovery of the amount of knowledge and interest Vic had about amateur-radio affairs in Bangladesh. Saif Shahid saw Vic for the last time in Tokyo in September, 1983, while both of them were attending WARIC. Only two weeks before his death, Vic had written a letter to Saif wishing BARL all success. No doubt, amateur radio has lost one of its most respected leaders.

The committee for 1984 also was elected as follows: President, M. Saifud Dahar Shahid; General Secretary, Mahbubul Huque Khan; Treasurer, Manzoor Mannan; Members at Large, Iqbal Ahmed and Kh. Nazrul Islam.

### BARL ANNUAL DINNER

The annual dinner was held on September 14, 1983, at the Hotel Sonargaon. The chief guest at the dinner was Prof. A. M. Patwary, Vice Chancellor of Bangladesh University of Engineering and Technology. Prof. Shamsuddin Ahmed, Chairman of the Department of Electrical and Electronic Engineering of BUET, also attended the dinner.

### NEW IARU CONSTITUTION PROPOSED

With the objective of a modern, stronger, and more democratic IARU, a new constitution has been proposed. The proposed constitution contains seven articles, organized in a logical progression. The constitution answers the basic questions of what is the IARU, what are its objectives, and how is it organized? It also sets forth the fundamental rights, duties, and obligations of member societies. The 18 bylaws, on the other hand, provide detailed descriptions of procedure and set forth additional rights, duties, and obligations that are somewhat less fundamental.

Under the new constitution, the rela-

tionships between the component parts (entities) of the IARU will be changed somewhat. The regional organizations become an integral part of the worldwide body, with increased authority and responsibility. The "Headquarters" function is transferred to the Administrative Council, with a member society serving as International Secretariat to perform administrative functions in support of the Administrative Council. The IARU president and vice president will be nominated by the International Secretariat in consultation with the Administrative Council, subject to ratification by the member societies; the secretary will be designated by the International Secretariat. The officers may be members of any member society.

### THE WARIC IN TOKYO

The World Amateur Radio International Conference was held in Tokyo, September 19–21, 1983, cosponsored by the Ministry of Posts and Telecommunications and the Japan Amateur Radio League, Inc., to commemorate World Communications Year. Saif Shahid attended at the invitation of JARL, as their guest. Besides Bangladesh, there were representatives from China, Federal Republic of Germany, Jordan, Korea, Malaysia, New Zealand, Nigeria, Oman, Pakistan, Thailand, Trinidad and Tobago, the UK, and the USA. In total, about 100 people attended the conference. The conference was particularly featured by the attendance of Richard E. Butler, Secretary General of the ITU, who participated in all conference events in addition to his impressive speech at the inaugural function.

The conference was chaired by the late Victor C. Clark W4KFC. The BARL representative was active in all conference activities and working-group meetings. In the concluding plenary session, the chairman read out to the house the news item from the *BARL Bulletin* regarding Wireless Board approval of amateur service in Bangladesh. The house applauded upon hearing the happy news. The conference adopted the Tokyo declaration.

### GENERAL SECRETARY IN GERMANY

Nizam Chowdhury, the founder General Secretary of BARL, recently left Dhaka for West Germany for a year-long training in telecommunications. Nizam is one of those fortunate few whose profession and hobby are in the same field. The Annual General Meeting paid rich tribute to the past activities of Nizam in promoting amateur radio in Bangladesh. We wish him success in his career.

Mahbubul Huque Khan took over the office as acting General Secretary for the rest of the term after Nizam's departure.

## BRAZIL

*Carlos Vianne Carneiro PY1CC*
*Rua Afonso Pena 49, Apt. 701*
*20270 Rio de Janeiro, RJ*
*Brazil*

CW operating is much, much more than simply traveling through a new and marvelous international world!

Put all that's happening to the communications world together, and Wayne Green's "Never Say Die" editorial in the January, 1984, issue says it perfectly, and all who really know amateur radio will agree that CW represents the fantastic guardian, the sure link between the first real touch and the final success for radio amateurs.

In Brazil, a continentally-dimensioned country, curiosity for this communication may be the cause for temporary interest, and a no-code Class C was responsible for a new wave of hams, 80 meters and VHF being their immediate goal. Also, CBers have come to amateur radio, trying this new opportunity with its less-populated bands and excited by the news of a no-code class.

Little by little, these newcomers discovered CW and what it really meant to be an amateur and to join all the wonderful options they had! At the least, CW is a bridge to working on antenna performances, and so a strong development in this field becomes a new and exciting challenge! And what about electronic keyers? And antenna tuners? And what about DX, the most fascinating "friend-factory" in radio? And what about QRP's fantastic surprises?

Most of all, CW brings you naturally to awards, and so you discover you're operating not just for operating, but because you're looking for something; you have a very stong reason to operate in this or that direction, aiming to hunt awards of all kinds. CW groups in Brazil are doing all they can to provide hams with a tremendous variety of awards.

The PPC Group has close to 20 awards, the CWRJ has almost 10, the CWP is now presenting a very interesting one, the GPCW in Santos has 4, the CWSP has 2—the second possible only if you complete the first—and the ABCW has 2 very interesting awards (one of them aimed at DX operations—the ATWAW). The CWRL, the GCWA, the CWGO, the CWSE, the PACW, the MCG, the MCPR, and all Brazilian groups have at least one award which is CW mode only.

We cannot keep up this rush: Last month's equipment is already obsolete because of competition between manufacturers. And costs are going up and up, and repairs are becoming owners' nightmares! Well, reasonably-priced equipment will pay wonderful dividends in CW, and even homemade QRP will bring you pennies from heaven at almost no cost if junk boxes are explored. Who can afford commercial prices? Only a few, considering this mess all around the world! Only a very strong force can keep amateur radio in many places and in many countries. And this force is the spirit of amateur radio strengthened and reinforced by CW, the most simple, the most efficient, the cheapest, and the most realizable of all options in our hobby.

### CWP—CW PETROPOLIS GROUP

Just born in Petropolis ("Peter Land," named after Brazilian emperors Peter I and Peter II), the Petropolis CW group is the youngest of our CW organizations. It is born to stay, according to the bunch of FB radio amateurs chosen to form the operating crew for the CWP Award.

The program is under the command of PY1DFF and PY1QQ (Claudio and Mac, well-known DXmen) with Ossir PY1YOC as right-hand help. Beautiful awards, already printed, and a well-spread net of A1 CW operators are the hope for an immediate success of this new incentive towards the use and the practice of the most simple and efficient of all modes of communications among Brazilian and other radio amateurs: faithful old CW!

The CWP Award may be obtained in three different classes:

Class One—Work 10 Brazilian cities plus two QSOs with CWP members or delegates;

Class Two—Work 20 Brazilian cities plus four QSOs with CWP members or delegates;

Class Three—Work 30 Brazilian cities plus six QSOs with CWP members or delegates.

*Attention*—Any CWP members or delegates can be used more than once if worked on different dates or bands!

Same rules apply for SWLs. No QSLs needed, but GCR apply. Fee: 7 IRCs. Mail to: CWP, PO Box 90415, 25600 Petropolis, RJ, Brazil.

CWP members: KA9KUH, PP2ADY, PP7JCO, PT2ACZ, PT2GK, PT7WA, PY1AFA, PY1APS, PY1AYE, PY1AZG, PY1BPR, PY1BVY, PY1CC, PY1DFF, PY1DK, PY1DMX, PY1DRW, PY1DWM, PY1DYO, PY1EBK, PY1EBN, PY1ECL, PY1EWN, PY1JF, PY1KT (YL), PY1MIT, PY1OB, PY1PL, PY1QN, PY1QQ, PY1RD, PY1TBW, PY1TG, PY1UBS, PY1URQ, PY1UTZ, PY1UUW, PY1UWI, PY1VEC, PY1VMV (YL), PY1WXU, PY1YOC, PY1YOV, PY1ZFF, PY2AC, PY2IL, PY2KQ, PY2MC, PY2MT, PY2ORW, PY2RLQ, PY2RRG, PY3MQ, and PY6AMJ.

All QSOs CW mode only; QSLs valid from December 1, 1983, on.

## CYPRUS

*Aris Kaponides 5B4JE*
*PO Box 1723*
*Limassol*
*Cyprus*

### THE LARNACA MARINA AMATEUR STATION, 5B4MM

On the south coast of Cyprus there is the town of Larnaca, built on the location of the ancient Greek city of Kition, the city of one of the great Greek philosophers, Zenon of Kition. Larnaca today is a small city of about 60,000 people, with an international airport, a seaport, and a very modern marina for small boats.

The Larnaca marina is under the jurisdiction of the Cyprus Tourist Organization, and it has a radio station for the VHF marine band, with 10-hour daily operation on the channels of international navigation. This station is assisting the overloaded Cyprus Radio and has handled to date over 47 distress calls.

With the increase of foreign craft in the marina and the increasing pressure of foreign boat owners came movement by the management of the marina to set up an amateur-radio station. After many difficulties, 5B4MM finally went on the air in December, 1982. It is the only station of its kind in the eastern Mediterranean.

The station is operating with the personal callsign of the director of the marina, Glafkos A. Kariolou 5B4MM. Installed inside the buildings of the marina, it has an IC-720A, an automatic tuner, and two simple dipoles for 2.182 MHz (marine) and 7.040 MHz. It also has a "Western Yankee" rotary beam for 14, 21, and 28 MHz.

The station is licensed by the Ministry of Communications and Works to operate also outside the amateur band on the international marine frequencies (2.182 MHz, etc.). In this capacity, the station uses the call LARNACA MARINA. Operating daily (except Friday and Sunday), transmission starts at 0830 UTC on 7.040 MHz with a weather bulletin for the sea area between Cyprus, Egypt, and Israel (35B.33B–30A.35A). This area has seacraft coming from the coast of Turkey, usually from America, England, Australia, or New Zealand. There is also a lot of traffic from the island of Rhodes, but more traffic is from Port Said, with boats entering the Mediterranean.

Information given by the station besides the WX report includes exchange rates of various Mediterranean countries, data on navigational beacons, hazards, and radio beacons. Given on request is medical advice, minor engine repair assistance, exchange of messages with other stations, relaying, and any other service within the framework of law and for the security of human life at sea.

The position of every craft (latitude, longitude) as well as the weather conditions facing it is recorded in detail, and routes of all are followed daily. In case there is unexplained absence from contact schedules, the embassy of the country to which the craft belongs is notified and also a general search call is given by the marina station.

At 0900 UTC, 5B4MM interrupts its transmission on 7.040 MHz and moves to 14.313 MHz, taking over from the international maritime amateur net station, INTERMAR (located in Hannover, Federal Republic of Germany, with OM Arno DKØSS). The same work is repeated here for sea areas around Sweden, England, the Canary Islands, and Port Sudan, including the Indian Ocean, depending on conditions. Here, important bulletins are issued about yacht thefts, missing boats, private raids, etc.

At 1000 UTC, the microphone goes back to Arno and 5B4MM listens periodically between 1000 and 1015 UTC on 21.380 MHz and from 1015 to 1030 UTC on 28.666 MHz.

The frequency of 14.313 MHz is used by six stations worldwide in turns, one being 5B4MM, on a 24-hour basis for maritime mobile radio amateurs. Many amateurs owe their lives to this completely voluntary service.

From the 5B4 point of view, the publicity given to 5B4-land is invaluable, and from the tourist side it is enough to say that yachts following the Cape Town and stateside route change their route to visit and get to know 5B4-land and its people.

The sked of 5B4MM, daily except Friday and Sunday:

7.040 MHz, 0830–0900 UTC
14.313 MHz, 0900–1000 UTC
21.380 MHz, 1000–1015 UTC
28.666 MHz, 1015–1030 UTC

## FEDERAL REPUBLIC OF GERMANY

*Ralf Beyer DJ3NW*
*Opferkamp 14*
*3300 Braunschweig*
*Federal Republic of Germany*

### INTRUDER WATCH

Almost everyone has experienced radio interference by stations not belonging to the Amateur Radio Service. But most of us ignore their transmissions if heard on our exclusive amateur-radio bands or subbands assigned primarily to ham radio. The average ham simply tunes to another frequency and hopes to have more fun there. However, this is not much of a solution to the problem.

The International Amateur Radio Union's Monitoring Service, with its headquarters in England (Region 1) and regional coordinators W7JIE (Region 2) and ZL1BAD (Region 3), addresses the problem on a worldwide basis. A number of national-intruder-watch services provide the

necessary fundamental work. DL4TA, EA4OK, F6GNP, G5XB, HB9QO, I2AMC, LU8DQ, OE6KOG, ON5AZ, PA0VDV, PT2JB, and YB0MS—to name a few—are representatives of the intruder-watch services in their respective countries.

The fundamental task of intruder-watch services is the collection of data about intruders on our ham bands. Our national representative, Ralf D. Kloth DL4TA, assisted by DJ9KR and DK3FQ, issues a monthly summary of intruder observations contributed by a dozen corresponding hams. About 500 observations are reported each month, including date/time, frequency, type of emission, identification/nationality, type of radio service, and further remarks. The summaries are circulated to the IARUMS and among the national intruder-watch services, and they are filed with the German FCC.

This documentation encourages the national FCCs to discuss the intruder problems with other cooperating FCCs who have jurisdiction over the reported intruders. Successful negotiations, for example, moved Radio Cairo from 7050 kHz out of the 40m band, removed a strong second harmonic emission of Radio Free Europe on 14330 kHz, prevented the establishment of a fixed R/T service between Madrid, Spain, and Malabo, Equatorial Guinea, on 21400 kHz, and convinced the Iranian press service, IRNA, not to utilize the 40m band for their RTTY transmissions. The majority of cases, however, still need to be resolved. Satisfactory solutions require patience, good will, and cooperation of the various FCCs involved.

A successful action against an intruder needs support by individual hams. The reason is simple: No interfering station can be considered an intruder if there is no complaint. The respective FCC, in turn, can reference number 115 of the ITU regulations which tolerate the assignment of frequencies to another radio service if no interference with existing services is involved. Therefore, as a general rule, do not tune away from an interfering station. Rather, file a complaint with your national intruder-watch representative and give him as much information as possible on the incident. Monthly reports are timely enough.

But you can do more. For example, occupy the frequency of the intruder and zero-beat his RTTY or CW signals. Chances are high that the intruder will start moving, because many commercial and military stations use equipment with no more power than ours. Of course, this technique is most efficient for simplex transmissions (transmit/receive on the same frequency), but sometimes it works out on duplex (split frequency) transmissions, too.

In cases where you are not allowed to communicate with the intruder directly, test your keyer on his frequency with the following test pattern:

(U)TA (OE)ASTOTA (OE)ASTX
MEVDUNARODNOJ L(IM)BITELXSKOJ
POLOSY (OE)ASTOT POVALUJSTA QSY
TOT(OE)ASVE

The letters shown in brackets should be keyed with no separation between them. It appears that some people in the eastern hemisphere interpret this pattern as "This frequency is part of the international radio amateur band—please QSY immediately." Some intruders have shown appropriate reaction. Thanks for this hint to ZL1BAD and *Ham Radio*, October, 1980.

In another attempt, DL9AH ran an automatic test in CW on the frequencies of broadcast stations in the 40m "exclusive" amateur-radio band, signing with his callsign. His 1-kW output signals—legal for a plate dissipation of the final amplifier not exceeding 150 Watts—could not be missed by potential broadcast listeners. The net result, however, is still to be determined.

Some people were able to confuse the woodpecker and make him move by a string of very-much-shortened dots from an electronic keyer. The "weight" control of the keyer did the trick. The efficiency of this measure is difficult to assess, particularly in the light of the sophisticated pulse coding of the woodpecker uncovered by G3PLX (*Wireless World*, April, 1982). But it is a fact that the woodpecker showed up less often when he had to share the frequency with a "string of dots."

All together, there are many ways to fight intruders, ranging from monthly reports to the intruder watch to the activation of occupied frequencies by whatever method is appropriate. In many cases, the required effort would take up only a few moments of your operating time. Wouldn't it be rewarding to spend this time to help defend our hobby?

## GREAT BRITAIN

*Jeff Maynard G4EJA*
*10 Churchfields*
*Widnes WA8 9RP*
*Cheshire*
*England*

1983 was a milestone year for the RSGB (Radio Society of Great Britain) with membership passing 35,000 for the first time ever. This increase shows a total growth in membership of 75% since 1977 and, I think, is due to two major factors.

First, there has been a steadily-increasing amateur population in the UK. The introduction a few years ago of the code-free Class B license (G8, G6, and G1 calls) for VHF only (144 MHz and above, to be more accurate) persuaded a great many more interested people to consider seeking a license.

Second, the increasing awareness of technology by "the man in the street" has broadened the spectrum of potential amateurs. There are also two particular technology-related areas that undoubtedly have produced a spin-off interest in amateur radio. These are computing and CB.

The UK has the highest per capita density of personal and home computers in the world. It is becoming increasingly difficult to find someone who does not own some form of computer. Although most computer/amateur-radio interaction has been from hams becoming involved with computers, there is evidence to suggest that computer enthusiasts have been attracted to amateur radio by applications such as satellite tracking and propagation prediction.

A recent survey of members of BARTG (British Amateur Radio Teleprinter Group) included questions about computers used now and planned for the future. Of the respondents, almost 65% currently have some form of computer system available for shack use. The predominant model is quoted as being from Sinclair (Timex in the US), although no breakdown is given between models. BBC and Commodore feature high on the list as well. Although the number of computers planned for the future is still only around two-thirds of respondents, the capabilities desired take a jump. Those hams currently into computing obviously want more use of discs, expanded memory, and printers. Clearly those aspects of amateur radio benefitting from computing (AMTOR, packet radio, satellite tracking, etc.) will be well represented in the UK.

I think I have mentioned previously that CB has been the biggest non-event of the decade as far as the UK is concerned. One-year CB licenses are being allowed to lapse in droves, and new license take-ups are very slow. No need to spell out the reasons for this. However, there has been a spin-off for amateur radio.

Many CBers who originally scorned amateur radio soon realized their mistake when legal CB first took off and 27 MHz was filled with the usual meaningless waffle (to say nothing of QRM, QRN, etc.). Couple this disenchantment with widely-available scanners listening to the (relative) calm of two meters, and you have a recipe for more hams.

Some interesting sidelines on UK CB—the 1984 version of the license specifically prohibits the playing of music and the retransmission of radio and television broadcasts; license holders must be aged 14 or more; loading coils can be located anywhere in the antenna and not only at the base (although antenna-length restrictions remain).

Back to the RSGB. The Society is also moving from strength to strength because of the increasing needs for amateur radio to be effectively and continually represented at government and other high levels in society. Continuing demands on our precious frequency allocations (particularly at UHF by the Ministry of Defence), increasing pressure for further restrictions on operating, regular misunderstanding and misquoting by the media, the difficulties of obtaining planning permission for towers, and the ever-present confusion with CB—all of these demand a strong representative body for amateur radio.

We are fortunate indeed to have such a body in the Society, but there are many other facets to the RSGB. The most obvious, and indeed most welcome, is the monthly *Radio Communication*. *RadCom*, as the Society's magazine is universally known, is not the only UK magazine devoted to amateur radio, but it is clearly the best and most comprehensive.

The Society operates an incoming and outgoing QSL bureau for all members. The service is free except for the provision of stamped, addressed envelopes with the incoming bureau. Outgoing cards need only be sorted into alphabetical order and dispatched to the QSL Bureau Manager. Incoming cards are handled by a number of sub-managers, depending on one's callsign. Envelopes are dispatched as soon as the postal weight limit is reached—this gives the recipient some flexibility in rate of return.

The Society represents the amateur population (including nonmembers) in relations with the governing Department of Trade and Industry. This not only includes constant lobbying on behalf of amateurs, but also includes the holding (by the Society) of all repeater and news-bulletin station licenses (UK stations are not allowed to establish personal or closed-group repeaters or to broadcast to non-specific recipients).

The Society's full-time staff coordinates a number of volunteer groups handling, among other things—

- planning applications
- intruder watch (regularly reporting on ham-band intruders)
- IARU representation
- Radio Amateur Emergency Network (RAYNET)
- repeater working groups
- propagation studies

Perhaps the best thing about the Society is that all of the above, including *RadCom*, costs only $20.00 per year. Enquiries not to the writer, please, but direct to The Radio Society of Great Britain, Alma House, Cranborne Road, Potters Bar, Herts. EN6 3JW, England.

## ITALY

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*Italy*

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*Italy*

The most important news from Italy is the new meeting that has been held in Rome with the management of the Telecommunication Department of the Ministry of P & T. With the presence of the Minister (I8XNG), the situation has been carefully examined and there is a much more hopeful possibility of reaching an agreement. A press release issued by the Ministry talks about "the possibility of allowing hams to use 2 meters mobile" and "a more effective presence of radio amateurs on 3.5–3.8 MHz."

Reading between the lines, it does not seem possible to go back exactly to the previous situation, but probably we will be allowed to use 3500–3525 and 3775–3800 plus another 50-kHz slice, and we will be allowed to go out of those frequencies for "replies to international calls." This way nobody will lose face and everybody will be happy.

It seems that the change of approach to the problem is mainly due to the personal interest of I8XNG and to the strong opposition to the new rules by the management of the Italian amateur league (ARI). All the management has resigned from the positions held.

### 73 CONTESTS

Propagation has not been too good, but a few of the local big guns have participated in the contests on 40 and 80. On the lowest band, they have not paid too much consideration to the new rules and they have operated on the 3775–3800 portion of the band that is at the moment off limits for us.

Scores probably will be on the same level as last year. There are some doubts about the rules that are assigning 5 points to USA contacts and 10 for the rest of the world. It would be better to give 5 points for contacts with your same continent and 10 for DX.

### PROPAGATION

Maybe you are interested in knowing what happens here in this period of low sunspot numbers. If you turn on the rig at 0700 local time, the only possibility (during January and February) is to go on 40 and try to work South America or VK. The band opens on 20 at 0730; you can "smell it" from the voices of UB5s and UA3s talking with each other. A few minutes later you start receiving weak signals from the Pacific. If the call is just a bit more exotic than a VK or ZL, the pileups are incredible. This situation lasts up to 0930; the skip then shortens and on 20 you have only Europe.

The choice is now between 10 and 15. Ten is very often completely closed. When not, it's very easy to find UJ8, UL7, AP, A4, and 4X4. On 15, the situation is the same

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with a few more possibilities to YB, VK, 9M, VS6, and often Japan.

At lunchtime, the propagation on 10 and 15 opens to Africa. There are few stations operating from there, but when they do, their signals are always very strong. In the afternoon, 20 meters opens to the US via long path and to the Far East.

The evening offers us the US via short path on 20, South America on the same frequency, and good openings on 40 to the Far East and Africa, followed shortly by 80 meters. The US is workable between 2300 and 0500 on both 40 and 80.

### LOCAL HAM PRODUCTS

VHF and UHF antennas of Japanese, American, and French production are very easy to find in local shops. A lot of approval has been given to some new locally-produced antennas and in particular to a 4-element delta loop with 13 dB of gain, a 12-element delta loop for 2 meters with 18 dB of gain, and the same one for the 70-centimeter band. A 23-element log periodic from 130 to 1300 MHz has just begun to be sold, while a 12-element log periodic for the 13–30-MHz band is ready to be introduced in the market. Will provide you with more information later on.

### SOCIAL ACTIVITY

I want to tell you about two examples of radio activity in Italy. First, the new QTH of the radio club of Civitavecchia (in the Rome area) is an old rail-truck that has been moved to the top of a 2000-foot hill! It is a strange QTH but can be a suggestion for others. In Italy, old railcars are not very expensive!

Second, there is a new emergency communication center for the Milan county authorities. It started activity at the end of 1983. The authorities provided all the logistics while the local radio shops have donated most of the equipment. The emergency center can work on all bands and has its own repeaters on VHF and UHF. It can work RTTY, fascimile, and satellites. Beams are available on HF, while particular attention has been given to the 80-meter band which is the only one capable of complete coverage of all the nation. The center can provide space for 6 operators at the same time. The antennas are mounted on top of a 150-foot building. A truck equipped with HF, VHF, and UHF rigs is always ready for use. The conference room of the center can accommodate 500 people.

### DX

The expedition to VU7 Laccadives has been the event of the month. It was very easy for us to work them, and a few of the local DXers have tried to work as many operators as possible as the callsign was the same for all of them. 15 meters was the easiest band, followed by 20. The activity on 10 meters was limited, but VU7 signals have always been strong.

The expedition also was spending a lot of time on 40 and 80 and this has allowed even the small pistols to work them. We are now waiting for Clipperton and Kermadec, and let's hope we will be in a position to say again it was not too difficult to work them.

T77C (ex M1C) is the first San Marino ham to achieve DXCC honor roll, and in the meantime, he has started to be active on 160. You can find him around 1.840 MHz. He has worked some Ws already and is looking for many more.

**de I2MQP**

Due to the limitations set by the Ministry of Posts and Telecommunications (MPT) to ham activity in Italy, a very heavy ill humor has befallen Italian radio amateurs. At the time this column is being written, we have the following situation.

- The 3.5-MHz band is reduced for amateur use to two thin slices, 3.613 to 3.627 and 3.647 to 3.667 kHz. Looking at these crazy numbers, one can understand that the 3.5-MHz band has practically been withdrawn as far as amateurs are concerned, because no serious DX or CW traffic may be carried on, referring to the IARU band plan.
- The MPT has assigned the band frequencies to other government services, mainly to the Defense and Interior Ministries. Every possible effort has been spent to explain to the MPT officials (and to their so-called technicians) that throwing Italian hams out of the band is meaningless, because the whole band is shared by foreign amateurs with foreign fixed and mobile services. They don't seem willing to understand these very simple matters, but the general opinion is that the MPT has already compromised itself with the assignment (or the promise) of wide-frequency subbands into the 3.5-MHz band to government agencies. Moreover, the MPT persists obstinately to sustain the principle that the "sharing" concept for a band means that it must be divided into subbands.
- The very old law ruling amateur activity in Italy states that every amateur station should be installed in the residence of the amateur and that the station may be moved only after the MPT has given written permission. The only allowance is made for the 144-MHz-and-up rigs with power not exceeding 5 Watts, which can be moved without permission. The law states "moved," but not operated on the way, which means that in Italy mobile operation is forbidden on both VHF and HF.

Although such statements make repeaters illegal also (which are installed on hilltops and not in the licensee's home), for many years Italian amateurs have used 144 mobile, playing with the ambiguity of the 144-MHz free-moving rule. They have installed a very efficient repeater net which played a big role during the emergency operations carried on during the course of the dramatic Friuli, Sicily, and Irpinia quakes.

- The new WARC bands have not yet been assigned to amateurs in Italy, and no provision has been made on the matter. Rumors are that the 10-MHz band will be divided into subbands, following the concept of the so-called engineers of the MPT, who seem to ignore that interpretation of the sharing concept is different all over the rest of the world and that radio waves don't know borders. On this basis, no more than 10 kHz will be allocated to the Amateur Service.
- For the past 25 years, the Administration did not care much when the Italian amateurs bypassed some outdated and ridiculous rules. In fact, they used the entire 3.5-MHz band according to the IARU band plan, they installed repeaters, and they worked 144 mobile. And the Administration did not move a finger in order to issue more adequate rules.

The reasons for the sudden and unexpected prosecution campaign of the MPT against amateurs, which started in June, 1983, are still not clear. Tight monitoring, inspections, fines, and license suspensions left the amateur community astonished—the more so because the Italian ether is the most chaotic and undisciplined in Europe, and amateurs considered themselves a quiet island in this stormy sea. Why harass the official amateurs when lots of illegal transmissions are carried on every part of the spectrum without apparent opposition by the MPT, asked the amateurs.

Unfortunately, in an emergency period like this, ARI showed a late and weak reaction. In the past years, ARI settled on lazy and ineffective political action in order to clear up problems of the amateurs with the MPT. One month ago, a meeting of ARI President Rosario Vollero I8KRV, the ARI Board, and the MPT officers was held, with incongruous results. The officers confirmed their will to allocate to the amateurs on the 3.5-MHz band only 100 kHz, from 3,500 to 3,600. Such an allocation would compel the phone stations to invade the CW portion of the band, with certain reactions from the IARU and foreign amateurs. At the same time, the MPT officers warned that 400 new inspectors would be put in service soon, and they announced tight inspections and checks also on the highways and roads to prosecute mobile operation. The reaction of the amateurs and of the ARI members was very heavy. President Vollero was accused of being the man responsible, having held the presidential charge for about ten years. His attitude toward the MPT was judged incongruous and supine, and he was charged with inadequate representativeness and lack of effective policy. At that point, Vollero and the entire Board of Directors resigned.

Rumors around were of plans of direct fights against the MPT: Somebody suggested an international mass mailing of cards directed to the Republic President, Sandro Pertini, with petitions on Italian amateur rights; another claimed that an occupation of the 3.5-MHz band with thousands of ham stations would be effective.

Some favorable movement started to appear inside the MPT. Maybe some politicals started to fear unfavorable damage to the MPT image, especially as far as foreign administrations and the IARU were concerned. The Minister of Telecommunications, in person, and the General Director of MPT suddenly invited the ARI President and the Board to a new meeting in the Minister's Gava office on January 20. That looked to be a bypass of the officers who had started the battle. In the course of the meeting itself, it appeared that some recognition was made of some requests of the amateurs, but it seemed clear also that the MPT was trying to get some concessions concerning renunciation of a part of the 3.5-MHz band.

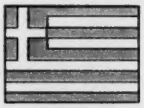
The MPT offered recognition of the VHF and UHF repeater net, a provisional allowance for mobile operation with 5-Watt maximum input, a possible early opening of the 1.8-MHz band and of the WARC bands, with some power and frequency limitations, but remained adamant about giving only 100 kHz to the amateurs on the 3.5-MHz band.

The ARI representatives, with members' pressure at their shoulders, refused to accept the 3.5-MHz proposed solution, stated many reservations about the proposed 5-W power input maximum rating for mobile use (mainly as far as HF was concerned), and said that the proposals would be discussed at the next ARI general meeting. A further meeting with the MPT officials was set for April 3, 1984.

Just after that date, a big international meeting of radio amateurs on emergency subjects will take place in Erice, Sicily, and IARU Region 1 representatives, the Minister of Telecommunications, and the General Manager of MPT have been invited. It appears clear that the MPT does not want to appear on that occasion as an enemy of amateur radio, thus the political pressure on the MPT technical staff which promoted this sort of war.

Surely there will take place a big battle at the next general meeting of ARI (which will be held in Rome next March). President Vollero I8KRV and his staff will try to be reconfirmed as heading the association, showing the partial success of their late effort. They will have the regional committees (which are the statutory organs which represent the members) to convince. The regional committees are of the opinion that a more incisive effort is needed in future approaches to the MPT and this shall be possible if the direction of ARI is given to amateurs who are in the position to be more respected by political and administrative personnel of the Italian government. That means that they should have a very good position as far as ties and friendships in the right direction are concerned. That does not mean that ARI should be politicized; it means only that ARI needs at its head people capable of some degree of political maneuvering. And that, in a country like Italy, where nothing is possible without politics, is essential also to defend amateur rights.

**de I8XXR**



## GREECE

*Manos Darkadakis SV1IW*
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*Athens 11210*
*Greece*

With the increased popularity of personal computers among radio amateurs worldwide, some interest appeared among SV amateurs three years ago. But, as in every small country, things were not so easy and some time had to pass by before availability became true for home computers in Greece. I think that today there are more people here selling computers than wanting to buy one!

Nowadays there is access to British and American markets and all big names plus the duplicates from Taiwan and Hong Kong are well represented. I have heard, lately, that the first Greek-made home computer is coming on the market, but up to now the only thing I know is that its name is Hermes (the Greek god and messenger of the gods). I will let you know when I have more information.

Of course, most of us want to go on RTTY with computers, and since the computer/modem combination is cheaper than the ready-made unit, this helped the interest to grow a lot. Now, there is a slight difference in software availability when someone comes to the point of choosing between an American and a British machine. In my opinion, the British ones lack serious programs for the radio amateur; if there are some, very few of them appeared in British ham magazines. On the other hand, American-made machines are more expensive, but there is plenty of software valuable to radio amateurs. Macrotronics, Kantronics, Micro-80, Inc., etc., for sure deserve a "bravo" for their excellent work in the amateur field. In the ham magazines, also, there are plenty of programs for radio amateurs; even computer mags such as *80 Micro*, *Rainbow*, *Run*, etc., include amateur-related material.

Although I have a TRS-80 Model I, level II, which has been out of production for some years now, I am able still to find programs for it today—and a lot of them.

Despite the situation described above, most of my fellow amateurs have British-made machines like Sinclair's ZX-81 and ZX-Spectrum. American-made machines are represented with a few Commodore VIC-20s and 64s, some TI 99/4As, and quite a few of Tandy Models I and II.

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By the way, European readers will find a lot of ideas as well as programs in a column named "Rubrique micro-informatique" which appears every month in REF's (French Radio Union) magazine. Both British and American machines are supported. Listings are very well printed and the people there are doing an excellent job.

See you next month.

## LIBERIA

*Brother Donard Steffes, C.S.C.*
*EL2AL/WB8HFY*
*Brothers of the Holy Cross*
*St. Patrick High School*
*PO Box 1005*
*Monrovia*
*Republic of Liberia*

The modern amateur radio is more and more push-button controlled. There are some amateurs who shed tears as they see this happening. The home-brew rig is a rare thing these days and these amateurs are sure that the whole hobby is going to the dogs. At least they see great changes taking place and they see little that is positive in the direction that things are going.

Traditionally, amateurs have been enterprising and innovative and the modern amateur has not lost this quality. A fertile mind and an energetic personality are not dependent on how the designers put together a radio. They cannot be squelched and if they are not building rigs from scratch, they are probably designing circuits to track satellites. One thing is certain: Amateurs are not sitting around doing nothing. As always, they are contributing significantly in the field of communications and communication equipment.

But here in Liberia we see these modern push-button radios from quite a different perspective. We tend, very quickly, to develop an aversion to switches. With our near-hundred-percent humidity, our tropical temperatures, and our harmatan dust, our switches stop switching. The air-conditioned home is not unknown, but not all amateurs have that luxury.

In this country, the amateur becomes the community repair man. "He knows everything about electricity." Into his shop comes anything that has ever seen an electron. When he takes off the cover, he finds molded coils and capacitors, mildewed circuit boards, rotted dial cords, rusted chassis. . . it is very discouraging.

The amateurs here are like amateurs in other parts of the world. They like their equipment and they do not sit around moaning as things deteriorate. They are very ingenious in devising ways to keep out moisture and dust. Some build cabinets with handy sliding doors to house their radio station. A desiccant inside helps to control the moisture. Others build shelves over their desk or table with air spaces under them. One or two well-placed light bulbs provide a convenient low heat source, and if everything is covered with a heavy cloth, it provides effective moisture and dust control.

It seems that in spite of everything that is done, it is necessary to polish the covers and lubricate the nuts and bolts several times a year or they will rust. During the rainly season, *it rains*. In Monrovia, it will total more than two hundred inches a year. During the dry season, there is the harmatan. The desert dust rises to more than forty thousand feet and blows across the whole country of Liberia. The natives like the harmatan because it tempers the blazing heat of the sun, but housewives and amateur-radio people do not like it at all.

In the tropical climate, everything that switches is going to stop switching much too soon. An obvious solution is to gold-plate all switch surfaces. Obvious also is the fact that so doing solves one problem while creating another!

## MALTA

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*Attard*
*Malta*

Since writing my first column in this widely-read magazine (June, 1983), I have the following to add. Quite recently, Maltese radio amateurs were given permission to own hand-held, portable, and mobile equipment. The use of this type of equipment is restricted in that it has to be used forming part of the fixed station at the owner's address. Permission to use hand-held and mobile equipment from any other location has to be sought by the club from the W/T Office and this permission may be granted only on special occasions such as Field Day. The use of mobile equipment while in motion is strictly forbidden. This bit of information may be of interest to those who would like to come and spend some time on the island, because they will be able to bring along with them small VHF rigs which are not as heavy as the HF rigs. The VHF rigs must, of course, comply with the local regulations and must not cover frequencies higher than 146 MHz.

### DXPEDITION

Some thirty members of the Malta Amateur Radio League (MARL) decided to put Comino Island for the first time ever on the air. This very small island lies about 15 minutes by boat from the mainland. The callsign used was 9H1MRL/A. Comino Island has only a handful of inhabitants. There are two very small but beautiful bays, the Blue Lagoon and Santa Maria Bay. The very luxurious Comino Hotel is also found on this little island, and it is usually visited by those who are interested in windsurfing.

The amateurs who took part in this expedition left the club premises in Attard (a small village situated in the center of Malta) at about 0400 GMT. That Saturday saw them taking all kinds of foodstuffs to last them a whole weekend. They also took with them an HF FT-101 transceiver and a TS-7000 VHF rig belonging to 9H1ES and 9H1FX respectively. The group arrived at Cirkewwa at about 0600, where all gear was loaded onto the patrol boat which took them to the islet. After all gear was taken from the boat, each one had to take his share of the load where it was decided to set up the station.

It was 0630 when some members started to erect the antennas, which consisted of three half-wave dipoles for 10, 15, and 20 meters for HF and a 12-element yagi for VHF. As there were no trees, erecting the aerials took quite some time, and it was only after a lot of improvisation that they were erected. At about 0745, 9H1O, who started operating the station, established the first contact with Australia, with VK2AKP. It was very astonishing that Sam VK2AKP was a Maltese national who had emigrated to Australia some twenty years ago! A lot of European and extra-European stations were worked both on SSB and CW while many Sicilian stations were contacted on VHF.

### AWARDS

The MARL issues three very nice awards: the DIP MED Award, the 9H Award, and the MARL Golden Jubilee Award. The DIP MED Award is awarded to any licensed amateur-radio operator, SWL, or club station on confirmation of 2-way QSOs on the HF or VHF bands. The HF applicant has to work a minimum of 15 of the 26 Mediterranean countries listed. The VHF applicant has to work a minimum of 5 of the 26 Mediterranean countries listed. In both the above, 9H is obligatory.

Albania, Algeria, Balearic Is., Ceuta, Melilla, Corsica, Crete, Cyprus, Dodecanese Is., Egypt, France, Gibraltar, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Sardinia, Sicily, Spain, Syria, Tunisia, Turkey, and Yugoslavia are the countries.

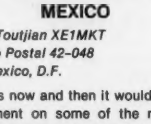
The 9H diploma is awarded to any licensed amateur-radio operator, SWL, or club station on confirmation of 2-way QSOs with 9H stations. Applicants in Europe need 10 points, and applicants outside Europe need 5 points. Each QSO with a 9H1 station counts as 1 point, each QSO with a 9H4 station counts as 2 points, and a QSO with 9H1MRL (club station) counts as 2 points.

No QSL cards are required for these diplomas. Send a certified list signed by another two amateurs together with 12 IRCs or US$2.00 if application is from Europe or 15 IRCs or US$3.00 if application is from outside Europe.

To commemorate the 50th anniversary of the founding of MARL, the League decided to issue a special award to be known as the MARL Golden Jubilee Award. Period: From 1st September 1983 until 30th September 1984. This award is available to licensed amateurs and SWLs (on heard basis).

To apply for this award, one must work 9H5ODC, the special station, which can be worked only once, and any other four 9H stations on any band and in any mode. Each station can be worked more than once on the same band but this must not be on the same day. No QSL cards are required, only a copy of the log certified by the awards manager of the national society or by two licensed radio amateurs. The fee for this award is US$3.00 or 15 IRCs.

Applications for any of the above awards should be addressed to: The President, MARL, PO Box 575, Valletta, Malta.



## MEXICO

*Mark K. Toutjian XE1MKT*
*Apartado Postal 42-048*
*06470 Mexico, D.F.*

I guess now and then it would be good to comment on some of the most frequently asked questions in letters that I have received from around the world since I have been a correspondent for *73*. I believe that if a fellow ham or anyone takes his or her valuable time to write, they should receive an answer, and since the answers to their questions may be of interest to many others, what better way to answer than through "73 International"!

In the February, 1984, issue, I commented extensively on the matter of getting a permit from the Mexican government to operate within the country on vacation or when passing through. I would like to add that your mobile or portable equipment should be registered by the customs officials at the border or place of arrival within the country, showing by means of approved documents that you are authorized to have and use such. Proper remarks will possibly be made on your tourist card so you will not have future problems during your vacation.

For our Mexican readers and for those in Mexico on vacation or passing through, *73* magazine can be purchased at practically any international airport in the country. In Mexico City, the famous Sanbourns restaurants, VIPS restaurants, and some American bookstores carry *73*. However, in spite of the relatively recent devaluation of the Mexican peso, the cost of *73* in Mexico (seemingly high locally) is obviously not high. It sells out at once.

Whenever I look for a certain issue when it supposedly is to come out, it's usually already sold out! I remember driving once from one end to the other of Mexico City only to come home empty-handed! (If you have ever been to Mexico City, you will sympathize with me.) So, Mexico sends its congratulations to *73* for a very fine magazine that sells just as well as the "quick tacos" on the streets! Wayne Green certainly does a fine job.

Some have asked me how I got started in ham radio. Well, besides the help I personally received from the Juarez City Radio Club and the Coatzacoalcos, Veracruz Radio Club (and especially from Mario Krespo XE1MCK), I read an article called "'Ham' Radio. . . A Hobby That Can Help Others," in the *Awake!* magazine (April 22, 1976, issue). I especially enjoyed it for its exactness and because, to me, it was written in plain language for a real beginner like myself. Back in those days, *Awake!* printed 9,925,000 copies of each issue in 32 languages! So it had to be simple and to the point and at the same time very interesting.

It also had a wide circulation in Spanish, here in Mexico. If you don't believe me, let me send you a photocopy of it in Spanish or English. Just send me a postal coupon and a few pesos and I'll have it Xeroxed and sent to you right away! Would be nice to have more literature for beginners (easy to understand) in Spanish as well! You never know, Wayne Green may surprise us some day! That would be wonderful for our Latin American colleagues! Think about it, Wayne! How many other thousands of future hams might get their start in the ham world by means of a beginner's book in Spanish, especially if it were very simple and up-to-date!

Most of the Spanish literature that I have seen available is old or just too technical for the beginner. (One possible reason for having so few hams in Mexico as compared to the US?) A beginner's book in Spanish could also aid the English-speaking to learn ham terms in Spanish. Then go for your Mexico license before coming down to warm Acapulco on vacation! It's just a six-hour drive from Mexico City, and you can stop off in Cuernavaca (known as the "eternal spring" since it is warm all year round) and then in Taxco to buy some good silver at low prices! If you would like to go out of your way, go to the state of Guanajuato, just north of Mexico City by a few hours, and have a leather case handmade for your handy portable!

Yes, Mexico is a very interesting and unique country with much variety and different cultures throughout. Spanish is the

*Continued on page 132*

# Dan, Bob & Frank Have It ALL!

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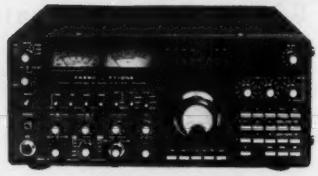

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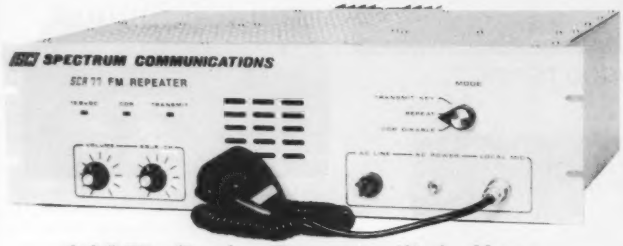
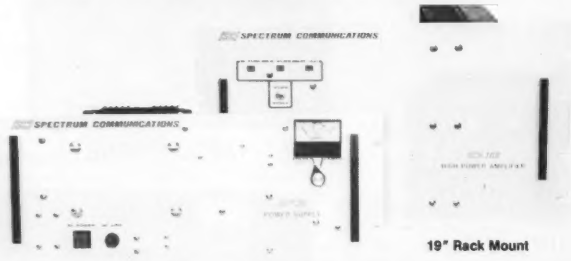



**SCR77 Basic Repeater/link Xcvr.**

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- **Rcvr. Bd. mounted in shielded housing.**
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- **As used in the SCR1000. Ready to drop into your system!**
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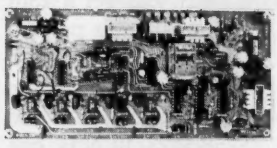
new



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### RPCM Board

- Used w/SCAP board to provide "Reverse Patch" and Land-Line Control of Repeater
- Includes land line "answering" circuitry

### Lightning Arrester For SCAP

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- Handles up to 20,000 Amps!
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FL-6

### FL-6 Rcvr. Front-End Preselector

- 6 Hi Q Resonators with Lo-Noise Transistor Amp (2M or 220 MHz).
- **Provides tremendous rejection of "out-of-band" signals w/out the usual loss!** Can often be used instead of large expensive cavity filters
- Extremely helpful at sites with many nearby VHF transmitters to "filter-out" these 'out-of-band' signals

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**For SCR1000/4000 & CTC100/ID250 only**

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- **TRA-1 "Courtesy Tone Beeper" Board**

### PRM200 Power Supply Filter Cap/Regulator/Metering Board

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- For SCR1000 or SCR4000. Replaces Darlington Pass Tr. for improved reliability.

### SCT110 VHF Xmtr/Exciter Board

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- With .0005% xtal.
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### SCT110 Transmitter Assembly

- *SCT110 mounted in shielded housing.*
- Same as used on SCR1000.
- Completely assmbld. w/F.T. caps, SO239 conn.
- 10, 30, or 75 Wt. unit.

### SCT 410B UHF Transmitter Bd. or Assy.

- Similar to SCT110, 10 Wts. nom.
- ✱ ***Now includes "on board" proportional Xtal Osc./Oven circuitry for very high stability!***
- **BA-40 40W. UHF AMP. BD. & HEAT SINK.**

new

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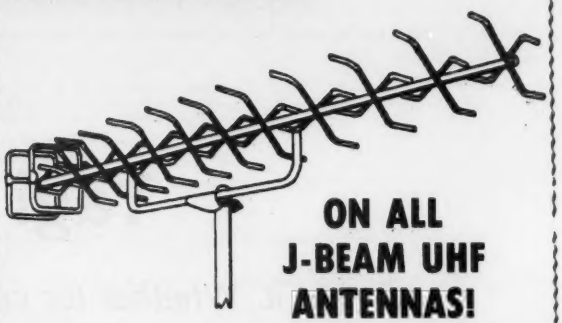

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**POWER AMPLIFIERS**

all models include RF VOX & Low Noise RX Pre-Ampl.
(no pre-amp in MML432-100 and up-1268-20/up-1296-20)

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|---|---|---|---|---|
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8 over 8 Horizon'l pol D8-2M $63.40
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# Yagi Fear?

*Forget it. Whether for construction or comparison, this Atari program zaps every design problem.*

Amateur-radio operators and shortwave listeners are always in need of a better antenna or an easier way of designing one. Also, teachers need a way of comparing one design with another as examples for their students.

Many superb antenna construction articles have been written over the years. However, there is still a frequent need for a design based upon a new frequency or number of elements. With the aid of the computer it is easy to compare design parameters for antennas having a differing number of elements.

This program was developed on an Atari computer for a yagi antenna having from 2 to 6 elements and is based upon the parameters of an idealized antenna model. The formulas used in the program have been generalized to increase simplicity. As a result, antennas constructed from the program data will function as indicated by the parameters. However, small ajustments of element lengths and spacing may prove beneficial for some parameters and applications—particularly if the same formulas are used for an increase in element number beyond six. An element spacing of 0.2 wavelengths was selected to reduce the effect of critical tuning parameters.

To simplify the construction of the program, repeating text messages—relating to element name, etc.—are stored as string statements. Several advantages occur as a result. It is easier to handle a string as a print requirement than it is to repeat the typing of each print statement. Of course, a real advantage occurs during editing of the entered program when a change or correction is to be made in the print statement. By having the statement contained within a string, a one-time "fix" in a single statement represents the change for every time the statement is called to print. In addition, a separate group of print statements was developed for each set of elements and for frequencies above and below 70 MHz. The frequency split was selected to accommodate the change in dimensions from feet for frequencies below 70 MHz to inches for frequencies above 70 MHz.

I—For/next loop counter
A$, B$, C$, D$, E$, F$, G$, H$, J$, K$, L$, M$, and N$—Print statements used during the printout of the design
P$—Temporary variable for entering a YES or NO response
F—Desired design frequency
N—Desired number of elements
EN—Element number print selector
BWL—Lower bandwidth limit
BWH—Upper bandwidth limit
W—Wavelength in feet
S—0.2 wavelength in feet
Z—Two wavelengths in feet
S1—Element spacing in feet
S2—Element spacing in inches
X—Wavelength in inches
D—Element diameter in inches
BD—Boom diameter in inches
A—Changes meters to feet
B—Changes meters to inches
RE/REF—Reflector length
DE/DEL—Radiator element length
D1/DD1—First director length
D2/DD2—Second director length
D3/DD3—Third director length
D4/DD4—Fourth director length
3—Clear screen

*Table 1. Variables used in the program.*

**Dimensions**

Dimensions for the antenna elements, element diameter, and element spacing are established as a function of wavelength by dividing 300 by the selected frequency in megahertz. Adjustments to the wavelength are made to compensate for a generalized velocity factor.

The program assumes that dimensions remain the same for an antenna array of 2 to 6 elements. With an element spacing of 0.2 wavelengths, dimension tolerances tend to be less critical than those arrays designed with narrower spacing. Element dimensions are given as a decimal for program convenience. However, generalized fractional dimen-

sions are also provided, based upon assumed available standard tubing dimensions.

Caution is suggested when selecting a boom diameter for an antenna designed for a frequency below 10 MHz. Although the program indicates a minimum boom diameter to provide support for the array, load factors, unsupported boom lengths, etc., must be considered. As the operating frequency decreases, the computer-derived boom diameter tends to be too small. The program does not restrict the design of a low-frequency yagi even though it may be mechanically impractical to build. There are times when the dimensions are desired as a comparison with other antenna types. A cautionary note is provided in the design printout, indicating that an alternate antenna design should be considered.

```
                CUSTOM DESIGNING A YAGI ANTENNA

THIS ANTENNA WAS DEVELOPED ON AN ATARI COMPUTER
AS COMPILED BY HUGH WELLS  W6WTU --JULY 1981.

THE ANTENNA'S CENTER FREQUENCY IS 146 MHZ.
THE YAGI IS TO HAVE 5 ELEMENTS.


* THE FOLLOWING DIMENSIONS APPLY TO THE DIAGRAM AT THE BOTTOM OF THE PAGE.

THE REFLECTOR ELEMENT IS 38.99 INCHES LONG.
THE DRIVEN ELEMENT IS 37.04 INCHES LONG.
THE FIRST DIRECTOR ELEMENT IS 35.19 INCHES LONG.
THE SECOND DIRECTOR ELEMENT IS 33.42 INCHES LONG.
THE THIRD DIRECTOR ELEMENT IS 31.76 INCHES LONG.

THE FORWARD GAIN OVER A DIPOLE IS APPROX. 9 DB
OVER THE FREQUENCY RANGE FROM 141.62 TO 150.38 MHZ.

FORWARD BEAM WIDTH IS APPROX. 40  DEGREES AT THE 3 DB POINTS.

FRONT-TO-BACK RATIO IS APPROX. 19 DB.

WHEN BUILDING AN ANTENNA, CONSIDER THE WIND AND BIRD LOADING
WHILE SELECTING THE ELEMENT DIAMETER AND MATERIAL.

THIS YAGI DESIGN ASSUMES A CYLINDRICAL ELEMENT OF CONSTANT DIAMETER.

THE OPTIMUM ELEMENT DIAMETER IS 0.234 INCHES.
SUGGEST USING 1/4 INCH MATERIAL.

THE OPTIMUM ELEMENT SPACING FOR HIGHEST FORWARD GAIN
IS 0.200 WAVELENGTH.

THE SPACING BETWEEN ELEMENT CENTERS IS 16.17 INCHES.

SELECT A MINIMUM BOOM DIAMETER APPROX. 1 1/2 TIMES THE ELEMENT DIAMETER.
WITH THE APPROX. DIAMETER BEING 0.5 INCHES.

IF THE ELEMENTS ARE ACCURATELY CENTERED ON THE BOOM, INDUCED CURRENT WILL
BE MINIMUM ALLOWING THE BOOM TO BE METAL IF DESIRED. INSULATION BETWEEN
THE BOOM AND THE ELEMENTS IS NOT REQUIRED.

THE FEED POINT IMPEDANCE OF A CENTER BROKEN DRIVEN ELEMENT IS LOWERED
TO APPROX. 10-20 OHMS (BALANCED) WHEN THE ELEMENT IS ENCLOSED
WITHIN PARASITIC ELEMENTS.

BECAUSE OF THE LOW IMPEDANCE VALUE, A MATCHING DEVICE SUCH AS
A 'T', GAMMA, OR BALUN MAY BE REQUIRED.

AN UNBROKEN ELEMENT MAY BE DRIVEN WITH A 'T' OR GAMMA MATCHING DEVICE.

THE FEED POINT IMPEDANCE OF A BROKEN ELEMENT MAY BE RAISED BY INCREASING
THE LENGTH-TO-DIAMETER RATIO. MAKING THE DRIVEN ELEMENT DIAMETER SMALLER
WILL INCREASE THE RATIO.

A FOLDED DRIVEN ELEMENT ENCLOSED WITHIN PARASITICS WILL EXHIBIT
A FEED POINT IMPEDANCE APPROACHING 52 OHMS-BALANCED.

YAGI ANTENNAS ARE FAIRLY HI-Q AND OPERATE OVER A NARROW FREQUENCY
BAND AT AN EFFICIENCY OF 75-95 PERCENT.

THE ANTENNA MUST BE MOUNTED A MINIMUM OF TWO
WAVELENGTHS ( 13.4 FEET ) FROM GROUND AND OR BUILDINGS.


                        BOOM |
REFLECTOR ----------|----------
                            |
DRIV ELEM  ---------|---------
                            |
1ST DIR     --------|--------
                            |
2ND DIR      -------|-------
                            |
3RD DIR       ------|------

                FORWARD DIRECTION
                        |
                        V
```

*Sample run.*

### Feedpoint

The question most asked about an antenna design is "How is the antenna to be fed?" For user convenience, coaxial cable is the most desired. However, not all antenna designs will provide an unbalanced feedpoint for coax. Therefore, if the antenna has a balanced feedpoint, a matching device will be required to convert from a balanced feedpoint to an unbalanced transmission line. A balun or gamma matching device will satisfy most applications.

Feeding a balanced feedpoint directly with coax causes a feedpoint discontinuity which will be observed as a vswr problem of about 1.5:1 which cannot be corrected by typical antenna adjustments. If only the balanced/unbalanced discontinuity problem exists, little user notice will be observed if the transmitter will tolerate the vswr incurred. Corrective action must be taken for a vswr exceeding 2.0:1 because a problem exists somewhere in the antenna feedline system. Many commercially-built transmitters have a vswr detector in the rf output circuit to limit the power output when the vswr exceeds a selected value. That vswr value may vary from 1.4:1 to 1.7:1, depending upon the manufacturer.

The radiator element of a yagi antenna is balanced whether or not it is broken (cut in the center). When broken, a single element in free space would exhibit a center feedpoint impedance of 60-70 Ohms balanced. As additional parasitic elements enclose the radiator to form a yagi, the feedpoint impedance may decrease to a value as low as 10-15 Ohms. The feedpoint will remain balanced regardless of the number of elements surrounding it. The specific feedpoint impedance will be determined by element spacing and radiator element length-to-diameter ratio.

Most baluns have a 4:1 impedance ratio with the highest impedance appearing at the balanced terminals and the lowest impedance at the unbalanced terminals. When used with a yagi, the balun could be attached to a "T" match on the unbroken radiator at the 100-Ohm balanced point. It would then match coax at 50 Ohms. A more practical

approach is to use a gamma match (one half of a "T" match) on the unbroken radiator. The gamma match is a variable impedance transformer capable of providing an unbalanced feedpoint having an impedance from about 15 to 100 Ohms which is suitable for most coax types.

### Antenna Gain

If an antenna were considered to be a point source in free space where it could emit energy equally in every conceivable direction, it would then have a gain of one. In a practical sense here on Earth, a point source cannot be achieved. A radiating device on Earth requires a support and will also radiate energy favoring one direction more than another. Although a point-source radiator is essentially impossible to construct, it is an ideal mathematical model for establishing gain concepts for practical antennas.

A dipole is a practical antenna which has a predictable and repeatable antenna-radiation pattern which can be described in terms of gain. A dipole, being resonant, will radiate energy perpendicular to the element plane causing very little if any energy to be radiated off the ends parallel to the axis of the element. More energy is radiated in one direction than in another, creating, in effect, a form of energy focusing.

To further understand the concept of gain, consider the antenna to be a transformer with a magnetic field being generated around the radiating element. Energy will be coupled from one element to another if the second element lies within the magnetic field generated by the first element. Of course, the elements must be in the same magnetic plane, as can be demonstrated with the primary and secondary windings of a transformer.

*Program listing.*

```
10 REM HUGH WELLS JULY 1981
20 GRAPHICS 18:POSITION 4,2:PRINT #6;"YAGI ANTENNA"
30 POSITION 6,4:PRINT #6;"PROGRAM"
40 FOR I=1 TO 3000:NEXT I
50 DIM A$(27),B$(13),C$(15),D$(24),E$(57),F$(33),G$(33),H$(44)
60 DIM J$(31),K$(33),L$(30),M$(33),N$(34),P$(1)
70 LPRINT :LPRINT "                    CUSTOM DESIGNING A YAGI ANTENNA"
80 FOR I=1 TO 5:PRINT :NEXT I:F=0:N=0:EN=0
90 LPRINT :LPRINT " THIS ANTENNA WAS DEVELOPED ON AN ATARI COMPUTER"
100 LPRINT " AS COMPILED BY HUGH WELLS  W6WTU --JULY 1981."
110 PRINT "ENTER THE CENTER FREQUENCY TO"
120 PRINT "THE NEAREST 0.1 MHZ."
130 PRINT "FREQ. IS ";:INPUT F
140 PRINT :PRINT "HOW MANY ELEMENTS IS THE"
150 PRINT "YAGI TO HAVE ( 2 TO 6 )?"
160 PRINT "NUMBER IS ";:INPUT N
170 LPRINT :LPRINT " THE ANTENNA'S CENTER FREQUENCY IS ";F;" MHZ."
180 LPRINT " THE YAGI IS TO HAVE ";N;" ELEMENTS."
190 LPRINT :BWL=0.97*F:BWL=INT(BWL*100):BWL=BWL/100
200 BWH=1.03*F:BWH=INT(BWH*100):BWH=BWH/100
210 W=300/F:S=W*0.2:Z=6.562*W
220 S1=S*3.281:S1=INT(S1*100):S1=S1/100
230 S2=S*39.37:S2=INT(S2*100):S2=S2/100
240 X=11803/F
250 IF F<10 THEN D=X*1.2E-03:GOTO 280
260 IF F<=23 THEN D=X*2.0E-03:GOTO 280
270 IF F>23 THEN D=X*2.9E-03:GOTO 280
280 D=INT(D*1000):D=D/1000
290 IF F<=100 THEN BD=D*1.5:GOTO 320
300 IF F<=200 THEN BD=D*2:GOTO 320
310 IF F>200 THEN BD=D*3.5:GOTO 320
320 BD=INT(BD*10+0.5):BD=BD/10
330 A=3.281:B=39.37:RE=W*0.482:DE=W*0.4579:DD1=W*0.435
340 DD2=W*0.4132:DD3=W*0.3926:DD4=W*0.37297
350 LPRINT :LPRINT " * THE FOLLOWING DIMENSIONS APPLY TO THE DIAGRAM AT THE BOTTOM OF THE PAGE.":LPRINT
360 A$=" THE REFLECTOR ELEMENT IS "
370 B$=" FEET LONG.":C$=" INCHES LONG."
380 D$=" THE DRIVEN ELEMENT IS "
390 E$=" THE FIRST DIRECTOR ELEMENT IS "
400 F$=" THE SECOND DIRECTOR ELEMENT IS "
410 G$=" THE THIRD DIRECTOR ELEMENT IS "
420 H$=" THE FORWARD GAIN OVER A DIPOLE IS APPROX."
430 J$=" OVER THE FREQUENCY RANGE FROM "
440 K$=" FORWARD BEAM WIDTH IS APPROX."
450 L$=" DEGREES AT THE 3 DB POINTS."
460 M$=" FRONT-TO-BACK RATIO IS APPROX."
470 N$=" THE FOURTH DIRECTOR ELEMENT IS "
480 IF N=2 THEN 550
490 IF N=3 THEN 710
500 IF N=4 THEN 930
510 IF N=5 THEN 1190
520 IF N=6 THEN 1490
530 GOTO 80
540 FOR I=1 TO 5:LPRINT :NEXT I
550 REM 2 ELEMENTS
560 IF F>70 THEN 620
570 REF=RE*A:GOSUB 2310
580 DEL=DE*A:GOSUB 2340
590 LPRINT A$;REF;B$
600 LPRINT D$;DEL;B$
610 GOTO 660
620 REF=RE*B:GOSUB 2310
630 DEL=DE*B:GOSUB 2340
640 LPRINT A$;REF;C$
650 LPRINT D$;DEL;C$
660 LPRINT :LPRINT H$;" 5 DB"
670 LPRINT J$;BWL;" TO ";BWH;" MHZ."
680 LPRINT :LPRINT K$;" 78 ";L$
690 LPRINT :LPRINT M$;" 8 DB."
700 GOTO 1820
710 REM 3 ELEMENTS
720 IF F>70 THEN 810
730 REF=RE*A:GOSUB 2310
740 DEL=DE*A:GOSUB 2340
750 D1=DD1*A:GOSUB 2370
760 LPRINT A$;REF;B$
770 LPRINT D$;DEL;B$
780 LPRINT E$;D1;B$
790 EN=3
800 GOTO 870
810 REF=RE*B:GOSUB 2310
820 DEL=DE*B:GOSUB 2340
830 D1=DD1*B:GOSUB 2370
840 LPRINT A$;REF;C$
850 LPRINT D$;DEL;C$
860 LPRINT E$;D1;C$
870 LPRINT :LPRINT H$;" 7 DB"
880 LPRINT J$;BWL;" TO ";BWH;" MHZ."
890 LPRINT :LPRINT K$;" 50 ";L$
900 LPRINT :LPRINT M$;" 10 DB."
910 EN=3
920 GOTO 1820
930 REM 4 ELEMENTS
940 IF F>70 THEN 1050
950 REF=RE*A:GOSUB 2310
960 DEL=DE*A:GOSUB 2340
970 D1=DD1*A:GOSUB 2370
980 D2=DD2*A:GOSUB 2400
990 LPRINT A$;REF;B$
1000 LPRINT D$;DEL;B$
1010 LPRINT E$;D1;B$
1020 LPRINT F$;D2;B$
1030 EN=4
1040 GOTO 1130
1050 REF=RE*B:GOSUB 2310
1060 DEL=DE*B:GOSUB 2340
1070 D1=DD1*B:GOSUB 2370
1080 D2=DD2*B:GOSUB 2400
1090 LPRINT A$;REF;C$
1100 LPRINT D$;DEL;C$
1110 LPRINT E$;D1;C$
1120 LPRINT F$;D2;C$
1130 LPRINT :LPRINT H$;" 8 DB"
1140 LPRINT J$;BWL;" TO ";BWH;" MHZ."
1150 LPRINT :LPRINT K$;" 45 ";L$
1160 LPRINT :LPRINT M$;" 12 DB."
1170 EN=4
1180 GOTO 1820
1190 REM 5 ELEMENTS
1200 IF F>70 THEN 1330
1210 REF=RE*A:GOSUB 2310
1220 DEL=DE*A:GOSUB 2340
1230 D1=DD1*A:GOSUB 2370
1240 D2=DD2*A:GOSUB 2400
1250 D3=DD3*A:GOSUB 2430
1260 LPRINT A$;REF;B$
1270 LPRINT D$;DEL;B$
1280 LPRINT E$;D1;B$
1290 LPRINT F$;D2;B$
1300 LPRINT G$;D3;B$
1310 EN=5
1320 GOTO 1430
1330 REF=RE*B:GOSUB 2310
1340 DEL=DE*B:GOSUB 2340
1350 D1=DD1*B:GOSUB 2370
1360 D2=DD2*B:GOSUB 2400
1370 D3=DD3*B:GOSUB 2430
1380 LPRINT A$;REF;C$
1390 LPRINT D$;DEL;C$
1400 LPRINT E$;D1;C$
1410 LPRINT F$;D2;C$
1420 LPRINT G$;D3;C$
1430 LPRINT :LPRINT H$;" 9 DB"
1440 LPRINT J$;BWL;" TO ";BWH;" MHZ."
1450 LPRINT :LPRINT K$;" 40 ";L$
1460 LPRINT :LPRINT M$;" 19 DB."
```

A higher antenna gain is exhibited when more of the radiated energy is coupled from the first element to the second by focusing (concentrating) the radiated energy. It is assumed that the radiated-power value remains constant and only the radiation pattern is manipulated. Since there is only a given amount of magnetic field generated around the first element, it is necessary to concentrate the magnetic field into the area (or direction) of the second element. The process is similar to focusing light energy with a reflector. A concentration of the field into one area has the same effect on the second element as if the radiated power had been increased. Antenna gain has been achieved by focusing the radiated energy.

A yagi antenna achieves gain by placing parasitic elements around the radiator. Each parasitic element is nearly resonant at the desired operating frequency of

```
1470 EN=5
1480 GOTO 1820
1490 REM 6 ELEMENTS
1500 IF F>70 THEN 1650
1510 REF=RE*A:GOSUB 2310
1520 DEL=DE*A:GOSUB 2340
1530 D1=DD1*A:GOSUB 2370
1540 D2=DD2*A:GOSUB 2400
1550 D3=DD3*A:GOSUB 2430
1560 D4=DD4*A:GOSUB 2460
1570 LPRINT A$;REF;B$
1580 LPRINT D$;DEL;B$
1590 LPRINT E$;D1;B$
1600 LPRINT F$;D2;B$
1610 LPRINT G$;D3;B$
1620 LPRINT N$;D4;B$
1630 EN=6
1640 GOTO 1770
1650 REF=RE*B:GOSUB 2310
1660 DEL=DE*B:GOSUB 2340
1670 D1=DD1*B:GOSUB 2370
1680 D2=DD2*B:GOSUB 2400
1690 D3=DD3*B:GOSUB 2430
1700 D4=DD4*B:GOSUB 2460
1710 LPRINT A$;REF;C$
1720 LPRINT D$;DEL;C$
1730 LPRINT E$;D1;C$
1740 LPRINT F$;D2;C$
1750 LPRINT G$;D3;C$
1760 LPRINT N$;D4;C$
1770 LPRINT :LPRINT H$;" 11 DB"
1780 LPRINT J$;BWL;" TO ";BWH;" MHZ."
1790 LPRINT :LPRINT K$;" 35 ";L$
1800 LPRINT :LPRINT M$;" 10 DB."
1810 EN=6
1820 LPRINT :REM ELEMENT DIAMETER
1830 LPRINT " WHEN BUILDING AN ANTENNA, CONSIDER THE WIND AND BIRD LOADING"
1840 LPRINT " WHILE SELECTING THE ELEMENT DIAMETER AND MATERIAL."
1850 LPRINT :LPRINT " THIS YAGI DESIGN ASSUMES A CYLINDRICAL ELEMENT OF CONSTANT DIAMETER."
1860 LPRINT :LPRINT " THE OPTIMUM ELEMENT DIAMETER IS ";D;" INCHES."
1870 IF D<=0.135 THEN LPRINT " SUGGEST USING 1/8 INCH MATERIAL.":GOTO 2000
1880 IF D<=0.3 THEN LPRINT " SUGGEST USING 1/4 INCH MATERIAL.":GOTO 2000
1890 IF D<=0.4 THEN LPRINT " SUGGEST USING 3/8 INCH MATERIAL.":GOTO 2000
1900 IF D<=0.5 THEN LPRINT " SUGGEST USING EITHER 3/8 OR 1/2 INCH MATERIAL.":GOTO 2000
1910 IF D<=0.6 THEN LPRINT " SUGGEST USING EITHER 1/2 OR 5/8 INCH MATERIAL.":GOTO 2000
1920 IF D<=0.8 THEN LPRINT " SUGGEST USING EITHER 5/8 OR 3/4 INCH MATERIAL.":GOTO 2000
1930 IF D<=1.2 THEN LPRINT " SUGGEST USING EITHER 1 OR 1 1/4 INCH MATERIAL.":GOTO 2000
1940 IF D<=1.6 THEN LPRINT " SUGGEST USING EITHER 1 1/4 OR 1 1/2 INCH MATERIAL.":GOTO 2000
1950 IF D<=1.8 THEN LPRINT " SUGGEST USING EITHER 1 1/2 OR 1 3/4 INCH MATERIAL.":GOTO 2000
1960 IF D<=2 THEN LPRINT " SUGGEST USING EITHER 1 3/4 OR 2 INCH MATERIAL.":GOTO 2000
1970 IF D<=2.3 THEN LPRINT " SUGGEST USING EITHER 2 OR 2 1/4 INCH MATERIAL.":GOTO 2000
1980 IF D>2.3 THEN LPRINT " * THE MATERIAL REQUIRED FOR THE YAGI MAY BE TOO HEAVY TO BE SELF SUPPORTING.'
1990 LPRINT "   SUGGEST CHOOSING A DIFFERENT ANTENNA DESIGN."
2000 REM BOOM
2010 LPRINT :LPRINT " THE OPTIMUM ELEMENT SPACING FOR HIGHEST FORWARD GAIN"
2020 LPRINT " IS 0.200 WAVELENGTH."
2030 IF F>70 THEN 2060
2040 LPRINT :LPRINT " THE SPACING BETWEEN ELEMENT CENTERS IS ";S1;".FEET."
2050 GOTO 2070
2060 LPRINT :LPRINT " THE SPACING BETWEEN ELEMENT CENTERS IS ";S2;" INCHES."
2070 LPRINT :LPRINT " SELECT A MINIMUM BOOM DIAMETER APPROX. 1 1/2 TIMES THE ELEMENT DIAMETER."
2080 LPRINT " WITH THE APPROX. DIAMETER BEING ";BD;" INCHES."
2090 LPRINT :LPRINT " IF THE ELEMENTS ARE ACCURATELY CENTERED ON THE BOOM, INDUCED CURRENT WILL"
2100 LPRINT " BE MINIMUM ALLOWING THE BOOM TO BE METAL IF DESIRED. INSULATION BETWEEN"
2110 LPRINT " THE BOOM AND THE ELEMENTS IS NOT REQUIRED."
2120 LPRINT :REM FEEDPOINT Z
2130 LPRINT " THE FEED POINT IMPEDANCE OF A CENTER BROKEN DRIVEN ELEMENT IS LOWERED"
2140 LPRINT " TO APPROX. 10-20 OHMS (BALANCED) WHEN THE ELEMENT IS ENCLOSED"
2150 LPRINT " WITHIN PARASITIC ELEMENTS."
2160 LPRINT :LPRINT " BECAUSE OF THE LOW IMPEDANCE VALUE, A MATCHING DEVICE SUCH AS"
2170 LPRINT " A 'T', GAMMA, OR BALUN MAY BE REQUIRED."
2180 LPRINT :LPRINT " AN UNBROKEN ELEMENT MAY BE DRIVEN WITH A 'T' OR GAMMA MATCHING DEVICE."
2190 LPRINT :LPRINT " THE FEED POINT IMPEDANCE OF A BROKEN ELEMENT MAY BE RAISED BY INCREASING"
2200 LPRINT " THE LENGTH-TO-DIAMETER RATIO. MAKING THE DRIVEN ELEMENT DIAMETER SMALLER"
2210 LPRINT " WILL INCREASE THE RATIO."
2220 LPRINT :LPRINT " A FOLDED DRIVEN ELEMENT ENCLOSED WITHIN PARASITICS WILL EXHIBIT"
2230 LPRINT " A FEED POINT IMPEDANCE APPROACHING 52 OHMS-BALANCED."
2240 LPRINT :LPRINT " YAGI ANTENNAS ARE FAIRLY HI-Q AND OPERATE OVER A NARROW FREQUENCY"
2250 LPRINT " BAND AT AN EFFICIENCY OF 75-95 PERCENT."
2260 Z=INT(Z*10):Z=Z/10
2270 LPRINT :LPRINT " THE ANTENNA MUST BE MOUNTED A MINIMUM OF TWO"
2280 LPRINT " WAVELENGTHS ( ";Z;" FEET ) FROM GROUND AND OR BUILDINGS."
2290 LPRINT :LPRINT :LPRINT
2300 GOTO 2490
2310 REF=INT(REF*100)
2320 REF=REF/100
2330 RETURN
2340 DEL=INT(DEL*100)
2350 DEL=DEL/100
2360 RETURN
2370 D1=INT(D1*100)
2380 D1=D1/100
2390 RETURN
2400 D2=INT(D2*100)
2410 D2=D2/100
2420 RETURN
2430 D3=INT(D3*100)
2440 D3=D3/100
2450 RETURN
2460 D4=INT(D4*100)
2470 D4=D4/100
2480 RETURN
2490 REM PRINT YAGI DIAGRAM
2500 LPRINT "                                        BOOM |"
2510 LPRINT "                    REFLECTOR ----------|----------"
2520 LPRINT "                                        |"
2530 LPRINT "                    DRIV ELEM  ---------|---------"
2540 IF EN>=3 THEN LPRINT "                                      |"
2550 IF EN>=3 THEN LPRINT "                          1ST DIR     --------|--------"
2560 IF EN>=4 THEN LPRINT "                                      |"
2570 IF EN>=4 THEN LPRINT "                          2ND DIR      -------|-------"
2580 IF EN>=5 THEN LPRINT "                                      |"
2590 IF EN>=5 THEN LPRINT "                          3RD DIR       ------|------"
2600 IF EN>=6 THEN LPRINT "                                      |"
2610 IF EN>=6 THEN LPRINT "                          4TH DIR       -----|-----"
2620 LPRINT :LPRINT :LPRINT "                                     FORWARD DIRECTION"
2630 LPRINT "                                          |"
2640 LPRINT "                                          V"
2650 LPRINT :LPRINT :LPRINT
2660 PRINT "}":FOR I=1 TO 10:PRINT :NEXT I
2670 PRINT "    DO YOU WANT ANOTHER DESIGN?"
2680 PRINT :PRINT "    ENTER Y/N ";:INPUT P$
2690 IF P$="Y" THEN PRINT "}":GOTO 70
2700 PRINT "}":FOR I=1 TO 10:PRINT :NEXT I
2710 PRINT "          BYE BYE !!!"
2720 PRINT :PRINT :PRINT
```

the radiator and will absorb some of the radiated energy. By being nearly resonant, each parasitic element creates a phase shift in the energy it re-radiates. Energy radiated rearward creates an out-of-phase condition, reducing the actual rearward radiated energy. In the forward direction, however, the phasing is such that energy radiated by each element is in phase and is reinforced as the energy moves forward. The reinforcement process creates the effect of gain through forward-power concentration.

In creating antenna gain by power concentration in the forward direction, the radiated energy in other directions (areas) around the antenna is reduced considerably. If a measurement is made of the energy radiated in the forward direction and the energy radiated rearward, an antenna's front-to-back ratio would be determined. The front-to-back ratio of an antenna is further indicative of its gain and ability to focus energy.

### Beamwidth

Beamwidth is another measurement of an antenna's ability to focus energy. The measurement is made by first establishing the antenna pattern which depicts the relative amount of energy radiated in a single plane around the antenna. The highest concentration of energy in one given direction is the forward direction. Beamwidth is determined by shifting angularly to either side of the forward position where the radiated power is down to one-half (−3 dB) of the forward-power position. The included angle between these two half-power points represents the beamwidth.

As the gain of an antenna increases, the beamwidth will decrease, indicating a higher concentration of energy in the forward direction. During antenna adjustments, a false sense of security can be developed if only beamwidth is observed as a gain factor. Yagi antennas have been known to decrease their beamwidth during adjustment while dispersing an increased amount of energy into a parasitic lobe (a power output in a direction other than the desired forward direction). When taken together, forward gain, beamwidth, and

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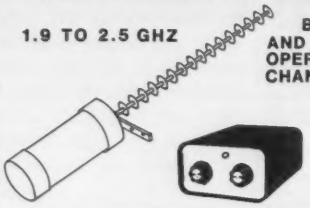

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front-to-back ratio represent the performance parameters of an antenna.

### General

Because of the rather lengthy printout for each antenna design, it is recommended that a printer be used rather than attempting to read the data from the screen. However, if a printer is not available, the LPRINT command may be changed to PRINT. To stop the screen from scrolling long enough to read the data, an INPUT command may be inserted into the program. It is suggested that INPUT P$ be inserted about every 20 screen printout lines. Pressing RETURN (ENTER) will allow the program to run up to the next INPUT.

A typical five-element design for 146 MHz is provided to show how the printout should look when the program is running properly.

To run the program, it is necessary to enter only the center operating frequency and the desired number of elements (2–6). As an example of what happens, if two elements are selected, the program will assume the elements to be the radiator and the reflector. Additional elements will be added as directors numbered one through four with number one being closest to the radiator; number four will be the farthest away from the radiator. An antenna diagram is printed at the end of the design printout to provide clarity of construction.

All elements are mounted in a single plane along a boom, with each element centered on the boom (or through the boom) to keep the induced boom currents to a minimum. Material for the boom may be wood, metal, or fiberglass, with only strength and weight being the criteria. Aluminum tubing has proven to be a successful material for both the boom and elements. ■

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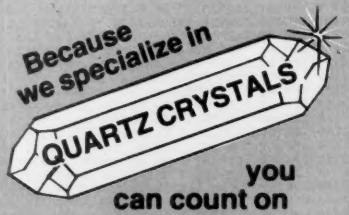


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| MINI-PROD | HQ-1 6M-20M MINI QUAD | 140.00 |
| MINI-PROD | B-24 6M-20M 2 ELEMENT BEAM | 113.46 |
| MINI-PROD | C-4 6M-20M VERTICAL | 66.75 |
| WILSON(MACO) | SY-33 10-20M 3 ELE. BEAM | 193.95 |
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| WILSON(MACO) | 33-6MK 40M ADD ON KIT | 67.95 |
| WILSON(MACO) | WV-1A 10-40M TRAP VERTICAL | 69.95 |
| WILSON(MACO) | GR-1 GROUND RADIAL KIT | 26.95 |

**ROTORS & CABLE**

| | | |
|---|---|---|
| HD-73 | ALLIANCE HEAVY DUTY ROTOR | 99.00 |
| U-100 | ALLIANCE LIGHT DUTY ROTOR | 45.00 |
| 8610 | 8 CONDUCTOR ROTOR CABLE | PER FT. 0.17 |
| 9091 | MINI RG8 (RG8X) COAX | PER FT. 0.16 |
| 9095 | RG-8U SUPERFLEX COAX | PER FT. 0.26 |
| 4063 | RG-213 MIL-SPEC COAX | PER FT. 0.28 |

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|---|---|---|
| MILLER | CS-201 2 POSITION COAX SWITCH | 19.95 |
| MILLER | CS-401 4 POSITION COAX SWITCH | 61.95 |
| MILLER | CN-620B 1.8-150MHZ SWR/WATT | 102.95 |
| MILLER | CN-720B 1.8-150MHZ SWR/WATT | 144.95 |
| MIRAGE | MP-1 1.8-30MHZ SWR/WATT | 99.95 |
| MIRAGE | MP-2 50-200MHZ SWR/WATT | 99.95 |
| WELZ | TP-05X 50-500MHZ SW FOR H/T | 19.95 |
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| 2010 | 12AMP SURGE,10AMP INT., 6AMP CONT. | 49.00 |
| 2020 | 24AMP SURGE,20AMP INT.,12AMP CONT. | 78.00 |
| 2030 | 36AMP SURGE,30AMP INT.,18AMP CONT. | 108.00 |

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|---|---|
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| MFJ-901 AS ABOVE WITH 4:1 BALUN | 49.95 |
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| MFJ-962 3KW,ANT.SWITCH,BALUN | 156.95 |
| MILLER CNA1001A AUTOMATIC TUNER 200W | 294.95 |

**COMPUTER ACCESSORIES**

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|---|---|
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| KANTRONICS HAMTEXT FOR VIC-20 | 82.95 |
| KANTRONICS MINI-READER CW/RTTY/ASCII | 239.95 |
| MFJ-1200 CW ONLY COMP. INTERFACE | 59.95 |
| MFJ-1224 CW/RTTY/ASCII COMP. INTERFACE | 88.95 |
| MFJ-1250 HAMSOFT FOR VIC-20 COMPUTERS | 39.95 |

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| DEBCO | DCCS1 DC QUICK CHARGER FOR S-1 | 30.00 |
| DEBCO | DCC2400 DC QUICK CHARGER TR-2400 | 30.00 |
| HY-GAIN | HQ-2S 10-20M QUAD | 234.00 |
| HY-GAIN | 6S-BS 6M 6 ELEMENT BEAM | 90.00 |
| HY-GAIN | 5DBQ 10-80M TRAP DOUBLET | 87.00 |
| INNERSPACE | 20 AMP POWER SUPPLY | 91.00 |
| KENWOOD | ST-1 DESK CHARGER FOR TR-2400 | 72.00 |
| SWAN | HFM200 HF MOBILE SWR/WATTMETER | 37.50 |
| TRAC | TE133 ELECTRONIC KEYER | 41.95 |
| TRAC | TE284 MEMORY ELECTRONIC KEYER | 67.50 |

**2 METER RADIOS**

| | | |
|---|---|---|
| AZDEN | PCS-300 FM HANDHELD,3W,8 MEM | 259.95 |
| AZDEN | PCS-4000 FM MOBILE,25W,16 MEM | 265.95 |
| KDK | 2030 FM MOBILE,25W,11 MEMORY | 259.95 |
| KDK | 2033 FM MOBILE,25W,11 MEMORY | 279.95 |
| SANTEC | ST-142 FM HANDHELD,3.5W,10 MEM | 279.95 |
| SANTEC | ST-144 FM HANDHELD,3.5W,10 MEM | 262.95 |
| TEMPO | S-1S FM HANDHELD,5W,5 MEM | 242.95 |
| TEMPO | S-1ST S-1S WITH 16 KEY TONE PAD | 265.95 |
| TENTEC | 2591 FM HANDHELD,2.5W,10 MEM | 262.95 |
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| ********** | | |

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| HT-ESM | SPEAKER MIKE FOR PCS-300 | 26.95 |
| HT-LC | LEATHER CASE FOR PCS-300 | 26.95 |
| ST-300B3 | SPARE BATTERY FOR ST-144 | 22.95 |
| SM-S | SPEAKER MIKE FOR ST-144 | 31.95 |
| ST-LC | LEATHER CASE FOR ST-144 | 31.95 |
| ST-4QC | AC CHARGER FOR ST-144 (4-6HR) | 61.95 |
| ST-6HC | AC CHARGER FOR ST-144 (6-8HR) | 71.95 |
| ACH-15 | AC QUICK CHARGER FOR S-15 | 52.95 |
| CC-15 | LEATHER CASE FOR S-15 | 21.95 |
| DCC-15 | DC & CHARGING CORD FOR S-15 | 12.95 |
| BP-15 | SPARE BATTERY FOR S-15 | 28.95 |
| MM-15 | SPEAKER MIKE FOR S-15 | 30.95 |
| OTHER ACCESSORIES AVAILABLE PLEASE CALL | | |

**2 METER BASE ANTENNAS**

| | | |
|---|---|---|
| BUTTERNUT | 2MCV 5/8 WAVE TROMBONE | 29.95 |
| BUTTERNUT | 2MCV-S 5/8 SUPER TROMBONE | 34.50 |
| CUSHCRAFT | ARX2B RINGO RANGER II | 34.00 |
| CUSHCRAFT | A144-11 11 ELEMENT BEAM | 44.20 |
| CUSHCRAFT | A147-11 11 ELEMENT BEAM | 44.20 |
| CUSHCRAFT | A144-20T 20 ELEMENT TWIST | 67.95 |
| CUSHCRAFT | A147-20T 20 ELEMENT TWIST | 81.95 |
| CUSHCRAFT | 214B & 214FB 14 ELEMENT BEAM | 74.95 |
| CUSHCRAFT | 32-19 19 ELEMENT BEAM | 88.95 |

**2 METER MOBILE ANTENNAS**

| | | |
|---|---|---|
| AVANTI | AP151.38 1/2 WAVE "ON GLASS" | 29.95 |
| CUSHCRAFT | AMB-147 MAGNET MOUNT | 27.95 |
| CUSHCRAFT | ATS-147 TRUNK MOUNT | 27.95 |
| HUSTLER | SF-2 5/8 WAVE 3DB GAIN | 10.95 |
| HUSTLER | CG-144 5/8 WAVE 5.2DB GAIN | 27.95 |
| VALOR | CX-144 5/8 WAVE 3DB GAIN | 9.95 |

**2 METER AMPLIFIERS**

| | | |
|---|---|---|
| MIRAGE | B23 FM/SSB 2W IN 30W OUT | 75.00 |
| MIRAGE | B108 FM/SSB 10W IN 80W OUT | 151.00 |
| MIRAGE | B1016 FM/SSB 10W IN 160W OUT | 235.00 |
| MIRAGE | B3016 FM/SSB 30W IN 160W OUT | 201.00 |
| VJ PROD. | 90L-PA FM/SSB 10W IN 90W OUT | 128.95 |
| VJ PROD. | 160L-PA FM/SSB 20W IN 160W OUT | 279.95 |
| TOKYO HIGH-POWER | HL30V 2 IN 30 OUT | 59.95 |
| TOKYO HIGH-POWER | HL82V 10 IN 80 OUT | 139.95 |
| TOKYO HIGH-POWER | HL160V 10 IN 160 OUT | 309.95 |
| TOKYO HIGH-POWER | HL160V2S 25 IN 160 OUT | 279.95 |

**HF/10M/6M RADIOS**

| | | |
|---|---|---|
| NCB | 10/160M,SSB/CW,4 MEM,3 WAY SCAN | 898.00 |
| TENTEC | ARGOSY 100W,SSB/CW,10-80M | 510.00 |
| TENTEC | CORSAIR 200W,SSB/CW,10-160M | 999.00 |
| TENTEC | OMNI-A 200W,SSB/CW,10-160M | 799.95 |
| AZDEN | PCS-4900 10M,FM MOB.,10W,16 MEM | 269.95 |
| AZDEN | PCS-4500 6M,FM MOB.,10W,16 MEM | 279.95 |

CALL FRANK WD5GZU, JOE KA5ROQ OR STEVEN KA5SWI FOR QUOTES ON OTHER RELATED PRODUCTS FOB ORIGIN.

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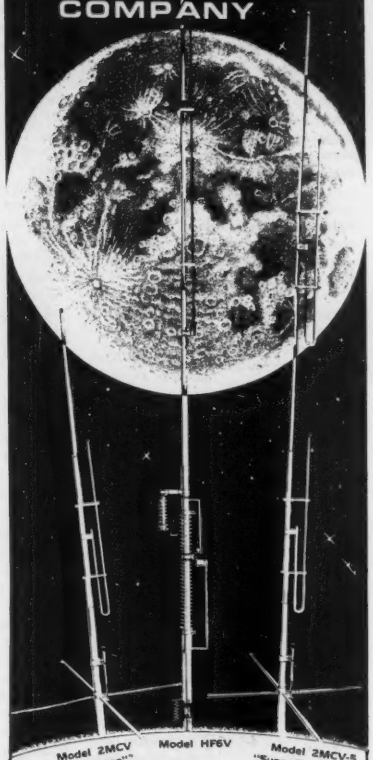

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✓See List of Advertisers on page 114

# HAM HELP

***We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½"×11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye." and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.***

I am looking for an RS-111 in any condition. Any leads will be appreciated.

**James A. Ross**
**7906 Hope Valley Ct.**
**Adamstown MD 21710**

I am looking for the service and instruction manual for the Lafayette PF-200A. I will pay copying and postage costs.

**Donald P. Quinn**
**43d USAAD A Team**
**APO NY 09080**

I have a large collection of your magazines (dating back approximately 14 years) which I am no longer able to keep in my home.

If you know of any school, organization, or person who might be interested in having these, please let me know. Many of them are in binders and I hate to throw out such a valuable collection.

**Bob Cambreleng WA2USW**
**9 Whitman Drive**
**Denville NJ 07834**

Can anyone supply information about a type CHC-46140 radio receiver made by Hammarlund? I have a schematic but no chart of values of components. Did this ever have a BC number or other nomenclature?

**Harry Church W9KXP/9**
**PO Box 126**
**Lebanon IL 62254-0126**

I have been teaching at God's Bible School now for eight years. Our school was started in 1900 to train future pastors and missionaries.

This year we started an amateur class in our college department for those who wish to work towards their licenses. We started out with twenty-four, but not all stuck it out. We now have nine with their Novice licenses. All are working toward their Generals, hopefully before the end of this school year. Others are working to finish up their Novice testing and also for further advancement.

What we are asking is, how can we get equipment to help train our students? We don't have funds to work with since this is a faith institution. We have heard that your Ham Help column has been very helpful to others, with ideas and sources for them to be able to obtain supplies and equipment. We would greatly appreciate any suggestions you may have. We are able to give receipts for tax deduction purposes and would be glad to do so.

If you are interested in knowing more about our amateur-class program, we would gladly furnish pictures or other information. We would even be happy to have you come see it for yourself.

Thank you for your time, and may the Lord bless you.

**Floyd E. Hyatt, Jr.**
**Head of Industrial Arts**
**God's Bible School**
**1810 Young Street**
**Cincinnati OH 45210**

Wanted: F455N20 Collins mechanical filter, 2 kHz, for an R390A receiver. Also need a manual for the BC-639 receiver.

**Pat Kelley WA3NYH**
**3831 Snavely Road**
**Middletown PA 17057**

I need the multiphase plug-in output couplers (10 and 15m) for the Central Electronics 200V transmitter or info on how to make them. Also, any info on the CE 200V would be appreciated.

**Howard M. Mills W3HM/DA1AK**
**HHC 440 Signal Bn.**
**APO NY 09175**

I am looking for a transceiver that would operate on all the popular amateur bands. I would like it to have sideband capability and perhaps digital readout. I would like to use this as a base station. Could you tell me where I might find a good up-to-date schematic and parts list?

I also would be interested in a good receiving-system schematic and parts list if such transceiver info is not available. I've looked all over and the best I could come up with is a 13-year-old receiver diagram.

**Mike Higgins**
**1155 Birchwood Manor**
**Aurora MO 65605**

I am an Advanced-class ham with a license that is only about 3 years old. I got into hamming because of my interest as a potential maritime-mobile when we retire aboard our boat.

Working the 14,313 net and other voice nets convinces me that it might be worthwhile to get into CW and RTTY for more reliable, if slower, communications under adverse conditions. I see all kinds of ads for communications interfaces, code readers, etc., and, frankly, I am overwhelmed by the variety of choices. What I should like to see is a good survey article which deals with the various possibilities that are available, making clear the range from the least expensive to the most luxurious, and what the extra bucks will buy one in terms of performance or modes of operation.

I am also interested in the possibility that with an interface between the receiver and a computer one could receive, store, and display facsimile transmissions such as those sent by NOAA. I realize that there is specialized equipment available for the purpose, but it is pretty expensive, and if one could make a computer serve two purposes with the aid of suitable software, that might be a popular route for people in my situation.

Finally, does anyone know how many of us are aready using the various modes of computer-aided communication? Some kind of statistics are needed to help a newcomer like myself avoid, on the one hand, going overboard with expenditures for equipment that will do everything (if there's hardly anyone using the fancier stuff) or, on the other hand, getting the minimum and finding that it won't talk with most of the crowd we want to talk to.

I enjoy 73—hope someone can help me.

**John H. Hughes N1BOS**
**28 West Drive**
**Marion MA 02738**

I have a Heathkit Twoer Model HW-30 2-meter AM rig.

I have written to Heath concerning changing this rig over to FM or PM. They suggested that I write to you. Please help! I'm a disabled Korean vet and love to DX. Thank you for your time and concern.

**Ivan E. Bates**
**USMC (Ret.)**
**117E Centennial**
**Boonville IN 47601**

I have recently acquired Sinclair's ZX Spectrum microcomputer. I urgently need CW-receiving software for it. I also need any other ham software for it.

**Ashmar Farman VU2FAX**
**178-A, Moazzampura**
**Hyderabad 500001**
**India**

I am looking for a Ten-Tec Power-Mite (PM 2) 80- and 40-meter CW transceiver in good working condition with an AC-3 converter for 15 meters. Also, does anyone have any information on how to make a memory expansion board for the VIC-20 that will give more than 16K? Preferably, I would like to expand to 64K or more.

**Fred J. Erickson**
**31 Ball Street**
**Orange MA 01364**

Wanted: Laser disk Sears catalog.

**PO Box 330**
**Valley Mills TX 76689**

I have a WWII Panadapter with a 500-kHz input from the receiver rf. It was used with a Collins 51-j during the war. I want to use it with my Icom 720A receiver with an i-f output of 39.7315 MHz. Has any owner of a 720A built a mixer of this sort? Is there a manufactured receive converter made that I could buy or perhaps an Icom 720A group that could help me? I will buy a unit or gladly attempt to build such a converter. I need the expertise of some friendly ham. I will gladly pay the cost of such a unit!

**James F. Hartley W1DIS**
**US Route #302, Box 11**
**Raymond ME 04071**

I need service manuals for a Boonton model 240-A sweep signal generator and a Fluke model 800 differential voltmeter. I will gladly pay copying and mailing costs. Please write first.

**Gordon Fulp W6FBH**
**4740 Scotch Pine Lane**
**Placerville CA 95667**

I have one of the original TRS-80 Model Is and would like a schematic for a printer interface.

**Joyce Amdor WB8ZQC**
**Box 39**
**Massena IA 50853**
**(712)-779-3435**

I hope that you can possibly help me via the "Ham Help/Info Requested" column of your magazine.

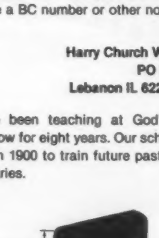
I am in possession of a 6-channel HF-SSB marine transceiver made by Maritek, model no. SB6-80, approximate date of manufacture, 1973.

I have been able to trace the company through the US embassy here in London (Maritek, 1819 South Central, Kent WA 98031), but letters have been returned "Not Known" and a phone number given was found to be disconnected.

I have at present no information at all on the Maritek SB6-80 and would like very much to have (a) a copy of the workshop service handbook and/or circuit details, (b) a copy of the operations handbook, and any other info (especially that on the settings of the taps of the output stage).

I can arrange to have these photocopied in the US, Canada, or here in the UK, and the original returned. I am willing to reimburse any expenses incurred.

**Kris Partridge G8AUU**
**6 Blagdon Walk**
**Teddington**
**London TW11 9LN**
**England**

PP-1
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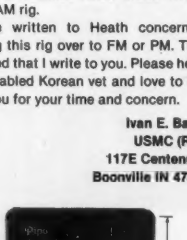

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# SOCIAL EVENTS

*Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by* 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

### CHICAGO IL
### MAY 2

The Chicago Amateur Radio Club's Evening Mini-Hamfest will be held on Wednesday, May 2, 1984, from 6:00 pm to 10:00 pm, at the Edgebrook Golf Course Field House, 6100 N. Central (between Elston and Devon), Chicago IL. Admission is $1.00 and card-table spaces are $3.00. Refreshments will be available. Talk-in on 146.52 MHz. For tickets, space reservations, or more information, send an SASE to CARC, 5631 W. Irving Park Road, Chicago IL 60634, or phone (312)-545-3622.

### ST. DAVID AZ
### MAY 4–6

The Cochise Amateur Radio Association, Inc., will hold a hamfest (upgraded from a swapmeet) on May 4–6, 1984, in St. David AZ. There will be a flea market and all tailgaters are welcome. Tours planned to Tombstone, the Bisbee Lavender Pit, and other places of interest. Talk-in on .16/.76 and .52 simplex. For more details, contact CARA, Attention: Bob Clay KB7HB, PO Box 1855, Sierra Vista AZ 85636.

### NASHUA NH
### MAY 4–6

The 10th annual Eastern VHF/UHF Conference will be held on May 4–6, 1984, at the Sheraton Tara, Exit 1, US 3, Nashua NH. Registration is $14.50 in advance and $20.00 at the door. Reservations for the Saturday-night banquet are $15.00 each, payable in advance. For advance registrations and banquet reservations, send a check to Rick Commo K1LOG, 3 Pryor Road, Natick MA 01760, before April 29th. Features will include a Friday-night hospitality room, technical talks by well-known VHFers, rap sessions for the various VHF/UHF bands, noise-figure and antenna measurements, and other activities. Room reservations should be made directly with the hotel (mention the Eastern VHF/UHF Conference) or other motels in the area. For further information, write Lewis D. Collins W1GXT, 10 Marshall Terrace, Wayland MA 01778, or phone (617)-358-2854 before 10:00 pm.

### LUFKIN TX
### MAY 4–6

The Region Four United States Air Force MARS will hold its annual conference on May 4–6, 1984, at the Rhodeway Inn, Lufkin TX. On Friday night there will be an administrative meeting for the headquarters personnel, state MARS directors, and all of the Region Four officials. For those not attending the meeting, the hospitality room will be open. On Saturday, there will be a series of presentations throughout the day, and that evening a banquet will be held for all delegates and their wives, followed by the annual awards. For further details, contact Ed Langston N5CIP, Conference Chairman, 1123 Sayers Street, Lufkin TX 75901.

### SACRAMENTO CA
### MAY 5

The North Hills Radio Club, Inc., will sponsor the 12th annual Sacramento Valley Amateur Radio Hamswap on Saturday, May 5, 1984, from 9:00 am to 3:00 pm, at the Placer County Fairgrounds, Roseville CA. Admission is free. Tables and tailgate reservations are $6.00 in advance and $8.00 on the day of the event. Talk-in on 144.59/145.19 MHz. For more information, contact D. Long, 8810 Swallow Way, Fair Oaks CA 95628.

### CEDARBURG WI
### MAY 5

The Ozaukee Radio Club will sponsor its 6th annual swapfest on Saturday, May 5, 1984, from 8:00 am to 1:00 pm, at the Circle B Recreation Center, Highway 60, Cedarburg WI (located 20 miles north of Milwaukee). Admission is $2.00 in advance and $3.00 at the door. Six-foot tables are $2.00 and eight-foot tables are $3.00. Food and refreshments will be available. Sellers will be admitted at 7:00 am for table setups. For tickets, tables, maps, or more information, send a business-size SASE to 1984 Ozaukee Radio Club Swapfest, PO Box 13, Port Washington WI 53074.

### OWEGO NY
### MAY 5

The 25th annual Southern Tier Amateur Radio Clubs Hamfest will be held on Saturday, May 5, 1984, at the Treadway Inn, Owego NY (take NY Route 17 to exit 65). The flea market will open at 8:00 am; other activities will include vendor displays and sales, tech and non-tech talks, and refreshments. Tickets for the dinner at 6:30 pm will be available by advance reservation only. Talk-in on .22/.82, .16/.76, and 146.52 simplex. For further information, please send an SASE to Craig P. England KF2X, RD #1, Box 144, Vestal NY 13850.

### MEADVILLE PA
### MAY 5

The tenth annual Northwestern Pennsylvania Hamfest will be held on May 5, 1984, beginning at 8:00 am, at the Crawford County Fairgrounds, Meadville PA. Admission is $3.00 and children under 12 will be admitted free. A 10-foot inside display table is $5.00 and an outside car space is $2.00. Refreshments will be available and commercial displays are welcome. Talk-in on 145.13, 147.21, 147.03. For more details, write CARS, Attention: Hamfest Committee, PO Box 653, Meadville PA 16335.

### GREENVILLE SC
### MAY 5–6

The Blue Ridge Amateur Radio Society will sponsor the Greenville SC Hamfest on Saturday and Sunday, May 5–6, 1984, at the American Legion Fairgrounds, White Horse Road, ½ mile north of I-85, Greenville SC. Admission is $3.00 in advance and $4.00 at the door. Food, plenty of nearby parking, and overnight camping with a limited number of hookups will be available. There will be drive-in unloading and loading before and after the hamfest. The area will be available for setups on Friday evening and security will be provided both Friday and Saturday nights. Talk-in on 146.01/.61. For advance tickets, write Mrs. Sue Chism N4ENX, Rte. 6, 203 Lanewood Drive, Greenville SC 29607. For further information, write Phil Mullins WD4KTG, Hamfest Chairman, PO Box 99, Simpsonville SC 29681.

### COLUMBIA MO
### MAY 5–6

The Central Missouri Radio Association will hold Columbia Hamfest '84 on May 5–6, 1984, at the Hilton Inn, I-70 and Stadium Boulevard, Columbia MO. Features will include forums, a hospitality room, a Saturday-night banquet, a hard-surfaced flea market, display tables, and shuttle-bus service to parking areas and shopping centers. Talk-in on .16/.76 or 220.42/.02. For banquet tickets, reservations for hotels, flea-market spaces or dealer tables, and more information, contact Ben Smith KØPCK, Route 1, Prairie Home MO 65068, or phone (816)-427-5319.

### KANKAKEE IL
### MAY 6

The annual Kankakee Hamfest will be held on May 6, 1984, beginning at 8:00 am, at the Kankakee County Fairgrounds. Tickets are $2.50 in advance and $3.00 at the gate. Features will include an FCC booth, a large flea market with both indoor and outdoor facilities, shuttle service from adjacent Greater Kankakee Airport, and refreshments. Talk-in on 146.34/.94. For motel reservations, call (815)-939-4551. For further information, phone Don Kerouac K9NR before 5:00 pm at (815)-937-2750, or write KARS Hamfest, 1377 Circle Drive NW, Kankakee IL 60901.

### LONG ISLAND
### MAY 6

The Suffolk County Radio Club Indoor and Outdoor Flea Market will be held on Sunday, May 6, 1984, from 8:00 am to 3:00 pm, at Republic Lodge No. 1987, 585 Broadhollow Road (Route 110), Melville NY. General admission is $2.00; children under 12 and wives will be admitted free. Indoor sellers' tables are $7.00 and outdoor space is $5.00 (includes one admission). There will be refreshments on the premises and plenty of free parking. Talk-in on 144.61/145.21 and 146.52. For additional information, contact Richard Tygar AC2P at (516)-643-5956 (evenings).

### SULLIVAN IL
### MAY 6

The Moultrie Amateur Radio Klub will hold its annual Sullivan IL MARK Hamfest on May 6, 1984, at the 4-H Fairgrounds, 3 miles east and 1 mile north of Sullivan on the Cadwell Road. Features include covered facilities, lunch, and a free swapper's row. Talk-in on 146.655/.055 and 146.520. For more information, contact William Guennewig WA9WOB at (217)-268-3139 (evenings).

### SANDWICH IL
### MAY 6

The Kishwaukee Radio Club of DeKalb IL will hold its annual hamfest on Sunday, May 6, 1984, at the Sandwich Fairgrounds, Sandwich. Tickets are $2.50 in advance and $3.00 at the door; tables are $5.00 each. Overnight camping without hookups will be available. For more information, contact Howard Newquist WA9TXW, PO Box 349, Sycamore IL 60178.

### PARAMUS NJ
### MAY 6

The Bergen ARA will hold a Ham Swap 'n' Sell on May 6, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only and admission for sellers is $4.00 (bring your own table). Buyers will be admitted free. Talk-in on .79/.19 and .52. For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

### CENTRALIA IL
### MAY 6

The Centralia Wireless Association, Inc., will hold its annual hamfest on Sun-


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day, May 6, 1984, at the Kaskaskia College Gymnasium, 3 miles northwest of Centralia IL. Admission to the hamfest is free and there will be no charge for the flea-market and exhibit space (a limited number of tables will be issued on a first-come, first-serve basis). Doors will open at 7:00 am for flea-market and exhibit setups. Food and refreshments will be available, as well as plenty of free parking. Talk-in on 147.27/.87 and 146.52. For further information, contact Bud King WB9QEG at (618)-532-6606 or Lou Hodges W9IL at (618)-533-4724, or write to CWA, Inc., PO Box 1166, Centralia IL 62801.

**DEERFIELD NH**
**MAY 12**

The Hosstraders will hold their Spring Tailgate Hamfest on Saturday, May 12, 1984, sunrise to sunset, at the Deerfield NH Fairgrounds. Admission is $2.00, including tailgaters and commercial dealers. For a nominal fee, there will be Friday-night camping for self-contained rigs. No one will be admitted before 4:00 pm Friday and no spaces will be reserved. Profits will benefit the Boston Burn Unit of the Shriners' Hospital. Last year's total donation was over $4,700. For further information or a map, send an SASE to Norm WA1IVB, RFD Box 57, West Baldwin ME 04091; Joe K1RQG, Star Route Box 56, Bucksport ME 04416; or Bob W1GWU, Walton Road, Seabrook NH 03874.


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**ROGERS AR**
**MAY 12**

The Northwest Arkansas ARC, Inc., will hold its 4th annual hamfest/swapfest on Saturday, May 12, 1984, from 8:00 am to 4:00 pm, in the Rogers Youth Center Building, 315 West Olive, Rogers AR. General admission is free. The fee for commercial exhibitors and flea-market tables/space is $2.00 on a first-come, first-serve basis. Doors will open at 6:00 am for setups only. Program activities have been scheduled and there will be a snack bar and parking on the premises. Restaurants are nearby. Talk-in on .16/.76 and .52 simplex. For more information, write Roy Milliren AF5W, 2014 South 16th Street, Rogers AR 72756.

**YAKIMA WA**
**MAY 12-13**

The Yakima Amateur Radio Club (W7AQ) will hold the Central Washington State Hamfest on May 12-13, 1984, at the Hobby Building at the Central Washington State Fairgrounds, Yakima WA. On Saturday, the hours will be 9:00 am to 5:00 pm with lunch available, and on Sunday, 8:00 am to 2:00 pm with breakfast and lunch available. Registration is $4.00 in advance and $5.00 at the door. Activities will include regional dealers' displays and a free swap and shop with plenty of tables. Talk-in on 146.01/.61 and 146.34/.94. For pre-registration, contact Bob Rutherford WB7WAM, PO Box 9211, Yakima WA 98909.

**MEDINA OH**
**MAY 13**

The Medina Two Meter Group will sponsor the Medina County Hamfest on May 13, 1984, from 8:00 am to 4:00 pm, inside the Medina County Community Center Building, Lafayette Road, State Rte. 42 SW. Tickets are $2.50 in advance and $3.00 at the door. Tables are $5.00 and some electrical hookups are available. Vendor setup will be at 7:00 am and refreshments and free parking will be available. Talk-in on 147.63/.03 (K8TV/R). For table reservations and advance tickets, write PO Box 452, Medina OH 44258, or telephone (216)-725-5021 or (216)-723-5010.

**BEDFORD PA**
**MAY 13**

The Bedford PA, the Altoona PA, the Somerset PA, the Cumberland MD Amateur Radio Clubs, and the Blue Knob Repeater Association will sponsor the second annual Southern Alleghenies Hamfest on May 13, 1984, from 8:00 am to 5:00 pm, at the Bedford County Fairgrounds, located one mile west of Bedford on Route 30 and one half mile west of the Route 220 bypass, close to the Bedford exit of the PA Turnpike. Admission is $3.00; inside spaces are $5.00 each and outside tailgate spaces are $2.00. Besides other hamfest activities, arrangements are being made for reduced rates to visit restored Old Bedford Village. Talk-in on 145.49 (Bedford repeater) and 146.52 simplex. For more information, call Tom Gutshall W3BZN at (814)-942-7334.

**STIRLING NJ**
**MAY 13**

The TCRA Flea Market will be held indoors on Sunday, May 13, 1984, from 9:00 am until 4:00 pm, rain or shine, at the Passaic Township Community Center, off Valley Road (opposite Jaeger Lumber and Building Material Center), Stirling NJ. Registration is $2.50 and tables are $6.00. Refreshments will be available. Talk-in on 147.855/.255 MHz and 146.52 simplex (W2LI/R). For table reservations or more information, write Dick Franklin W2EUF, PO Box 182, Westfield NJ 07090, or call (201)-232-5955 or (201)-270-3193.

**WAGONER OK**
**MAY 18-20**

The Broken Arrow Amateur Radio Club and the Tulsa Amateur Radio Club will sponsor the Greencountry Hamfest on May 18-20, 1984, at the Western Hills Lodge in Sequoyah State Park, located 6 miles east of Wagoner. Registration is $2.50 in advance or $3.00 at the door. There will be programs for the entire family. For more information, write Broken Arrow Amateur Radio Club, Inc., PO Box 552, Broken Arrow OK 74012.

**FRESNO CA**
**MAY 18-20**

The Fresno Amateur Radio Club will hold the 42nd annual Fresno Hamfest on May 18-20, 1984, at the Tropicana Inn, Fresno CA. The hours on Friday are 7:00 pm to 10:00 pm and on Saturday and Sunday, all day and evening. Before May 11th, full registration is $23.00 and banquet-only tickets are $14.00. After that date, full registration is $25.00 and banquet-only tickets are $16.00. Partial registration is $5.00 and tickets for the ladies' luncheon and program are $6.50. Other activities will include golf, technical sessions, a transmitter hunt, an ARRL forum, a QCWA


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meeting, and a swap meet. Talk-in on 146.34/.94. For reservations and more information, write Fresno Amateur Radio Club, Inc., PO Box 783, Fresno CA 93712, or phone (209)-268-6314 or (209)-225-4699.

**DURHAM NC**
**MAY 19**

The Durham FM Association will hold the Durham Hamfest on May 19, 1984, at the South Square Mall in Durham NC. There will be shopping and movies for the ladies. Talk-in on 147.225/.825.

**BIRMINGHAM AL**
**MAY 19-20**

The Birmingham Amateur Radio Club will hold its annual Birminghamfest on May 19-20, 1984, beginning at 9:00 am each day, in the air-conditioned Birmingham/Jefferson Civic Center. Admission is $4.00 per person, valid for both days, and children under 12 will be admitted free. Flea-market reservations are not required and table rental is $6.00 per table per day. Setup time will be available Friday night and at 7:00 am on Saturday and Sunday. Features include an ARRL State Convention, Wouff Hong, a CW contest, a homebrew contest, meetings, forums, non-ham activities, a banquet, a flea market, and exhibitions. Talk-in on 146.34/.94 (W4CUE/R). For more information, write to Birminghamfest, PO Box 603, Birmingham AL 35201, or phone Keith Landrum KD4DQ at (205)-823-1628 after 6:00 pm Central.

**BOULDER CO**
**MAY 20**

The Rocky Mountain VHF Society, Inc., will hold the annual spring hamfest on Sunday May 20, 1984, from 9:00 am to 3:00 pm, rain or shine, at the Boulder National Guard Armory, 4750 North Broadway, Boulder CO. Admission is a $3.00 donation per family. There is no seller's charge but sellers should bring their own tables. Some tables will be provided, but if more than one table is needed, sellers should contact the organizers in advance. Features will include a big ham swap, technical demonstrations, and seminars. Food and drink will be available. Talk-in on 146.16/.76 and 146.52. For more information, write Richard Ferguson KA0DXM, 1150 Albion Road, Boulder CO 80303, or phone (303)-499-2871.

**PITTSBURG KS**
**MAY 20**

The Pittsburg Repeater Organization will hold its annual hamfest on May 20, 1984, from 10:00 am to 5:00 pm, at Lincoln Center, Lincoln Park, Pittsburg KS. Admission is $2.00 for each amateur and includes his family. Activities will include a flea market and a covered-dish dinner. (Please bring a covered dish; chicken will be provided.) For more information, write to Pittsburg Repeater Organization, c/o Steve Cooper, 1405 N. Elm, Pittsburg KS 66762.

**UNION NJ**
**MAY 20**

The Irvington Radio Amateur Club will hold its 12th annual hamfest on May 20, 1984, from 9:00 am to 3:00 pm, in new and expanded quarters at the Boys & Girls Club, 1050 Jeanette Avenue, Union NJ. Tickets are $1.00 in advance and $2.00 at the door; tables are $5.00 each. There will be plenty of on-site parking. Talk-in on .34/.94 and .52 direct. For table reservations, advance tickets, or more information, phone Walt W2QR evenings at (201)-763-2280, or write Ed Surmaitus WA2MYZ, 2133 Stanley Terrace, Union NJ 07083.

**OAK HARBOR OH**
**MAY 20**

The Sandusky-Ottawa County Combined Hamfest will be held on May 20, 1984, at the Ottawa County Fairgrounds, State Route 163, 3 miles east of Oak Harbor OH. Tickets are $2.50 in advance and $3.00 at the gate. Food, tables, and free parking will be available. Talk-in on 147.675/.075 and .52 simplex. For more information, write John Dickey, 545 N. Jackson Street, Fremont OH 43420.

**ATHENS OH**
**MAY 20**

The 5th annual Athens County Amateur Radio Association hamfest will be held on Sunday, May 20, 1984, rain or shine, from 8:00 am to 3:00 pm, at the Athens City Recreation Center, 733 East State Street, Athens OH (US 50 east). Admission is $3.00 at the gate. There will be acres of paved area for outdoor tables and tailgate displays at $2.00 per space. Indoor tables are $3.00 and are available by calling Joe NE8R, club president, at (614)-797-4874 for reservations. There will be plenty of parking and refreshments will be served. Talk-in on .34/.94 and .52. For further information, send an SASE to ACARA, PO Box 72, Athens OH 45701.

**WRIGHTSTOWN PA**
**MAY 20**

The Warminster Amateur Radio Club, Inc., will hold its 10th annual hamfest on Sunday, May 20, 1984, rain or shine, beginning at 7:00 am, at the Middletown Grange Fairgrounds, Penns Park Road, Wrightstown PA. Donations are $2.00 each in advance and $3.00 each at the door; XYLs and children will admitted free. Tailgaters will be charged an additional $2.00 for a 10-foot outdoor space; some 8-foot indoor spaces without power will be available. Food and drink will be served. Talk-in on 147.69/.09 MHz and 146.52 MHz. For more information and pre-registration, contact Bill Cusick W3GJC, Apt. 706, Garner House, Hatboro PA 19040, or phone (215)-441-8048.

**WABASH IN**
**MAY 20**

The Wabash County Amateur Radio Club, Inc., will hold the 16th annual Wabash Hamfest on Sunday, May 20, 1984, from 6:00 am to 4:00 pm, at the Wabash County 4-H Fairgrounds, State Route 13, Wabash IN. Donations are $2.50 in advance and $3.00 at the gate; advance reservations are requested. The flea market includes new and used gear in an unlimited outdoor area, and major vendors will be in an indoor area. There will be free overnight parking at the fairgrounds, local motel lodgings, and reasonably-priced food available. Talk-in on 147.63/.03, 146.52/.52, and 146.94/.94. For advance tickets, write Don Spangler W9HNO, 235 Southwood Drive, Wabash IN 46992, or phone (219)-563-5564.

**FITCHBURG MA**
**MAY 20**

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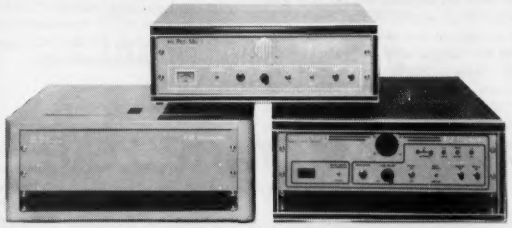

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sociation will hold an indoor flea market on Sunday, May 20, 1984, from 9:00 am to 3:00 pm, at the Fitchburg Civic Center, 1000 John Fitch Highway, Fitchburg MA. Admission is $1.00 and tables are $8.00 each. Doors will open for sellers at 8:00 am. Refreshments and plenty of free parking will be available. Talk-in on 145.45/.85 and 146.52. For space reservations, send a check payable to MARA to Jim Beauregard KB1AY, 7 Mountain Avenue, Fitchburg MA 01420.

### PUTNAM CT
### MAY 20

The Eastern Connecticut Amateur Radio Association will hold its 10th annual flea market on May 20, 1984, from 9:00 am to 2:00 pm, at the Elks Hall, Putnam CT. Tables are $7.00 in advance and $9.00 at the door. There will be good food and beverages. Talk-in on 147.225/.825 and .520. For further information and advance reservations, write Richard Spahl K1SYI, Lake Parkway, Webster MA 01570, or phone (617)-943-4420, or Donald Amirault K1APE, 66 Labonte Road, RR #1, Box 310, Thompson CT 06277, or phone (203)-923-2727.

### KINGSTON ONT CAN
### MAY 25–26

The Air Force Telecommunications Reunion to honor the 50th anniversary of Air Force communications will be held on May 25–26, 1984, at the Canadian Forces School of Communications and Electronics at Kingston. Reservations are $10.00 (refundable). This is a reunion of all who are serving or have served in the Air Force telecom world and their spouses. For more information, contact the Air Force Telecom Reunion Committee, CFB Kingston, Kingston, ONT K7L 2Z2. For reservations, send a check or money order to the same address.

### KNOXVILLE TN
### MAY 26–27

The Radio Amateur Club of Knox County will hold its 18th annual hamfest on May 26–27, 1984, at the Kerbella Temple Auditorium, just east of US 441 at the Tennessee River behind the Vol Inn Motel. The hours on Saturday will be from 9:00 am to 5:00 pm and on Sunday, from 10:00 am to 4:00 pm. Admission is $3.00. Features will include radio and computer forums, dealers, indoor and tailgate flea markets, and free parking. Talk-in on 147.90/.30. For more information, write Larry Poore N4EHR, 4320 Felty Drive, Knoxville TN 37918, or phone (615)-687-3154.

### WEST FRIENDSHIP MD
### MAY 27

The Maryland FM Association will hold its annual hamfest on Sunday, May 27, 1984, from 8:00 am to 4:00 pm, at the Howard County Fairgrounds in West Friendship MD (about 30 miles west of Baltimore on I-70). Admission is a $3.00 donation, tailgating is $3.00, and inside tables are $6.00 each in advance and $10.00 each on the day of the hamfest, if available. Commercial vendors must have proper tax-license certificates available and items offered for sale must be amateur-radio related. Talk-in on 146.16/.76 and 146.52. For table reservations or more information, write MFMA Hamfest Committee, c/o John Elgin WA3MNN, 8216 Styers Court, Laurel MD 20707, or phone (301)-621-2352.

### BLACKSBURG VA
### MAY 31–JUN 2

Virginia Polytechnic Institute and State University will hold a new workshop, Personal Computer and STD Computer Interfacing for Scientific Instrument Automation, on May 31–June 2, 1984, at Virginia Tech, Blacksburg VA. The workshop is $395.00 for the three days and will be directed by Mr. David E. Larsen, Dr. Paul E. Field, Dr. Jonathan A. Titus, and Dr. Christopher Titus. Each participant will wire and test interfaces. For more information, write Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg VA 24061, or phone (703)-961-4848.

### GUELPH ONT CAN
### JUN 2

The Guelph Amateur Radio Club (VE3ZM) will hold the 10th annual Central Ontario Amateur Radio Flea Market and Computerfest on Saturday, June 2, 1984, from 8:00 am to 4:00 pm, at Regal Hall, 340 Woodlawn Road West, Guelph ONT. General admission is $2.00 and children 12 years and under will be admitted free. Vendors' admission is $5.00 per 8-foot space. Doors will be open to vendors only from 6:00 am and a quantity of 3' × 8' tables will be available for rental for $5.00 each. Features will include commercial displays, surplus dealers, computer software and hardware, indoor and outdoor displays, and a refreshment concession. Talk-in on 147.960/147.360 (VE3ZMG) and .52/.52 simplex. For further information, contact Susan Barabus VE3BEC or Joe Barabas VE3BXN at (519)-824-1404 (Guelph), Ralph Bartlett VE3BJX at (519)-836-2097 (Guelph), Henry Christiansen VE3BYU at (519)-743-9022 (Kitchener), Fred Hammond VE3HC at (519)-822-8323 (Guelph), or the Guelph Amateur Radio Club, PO Box 1305, Guelph ONT N1H 6N9, Canada.

### ST. PAUL MN
### JUN 2

The North Area Repeater Association will sponsor a swapfest and exposition for amateur-radio operators on Saturday, June 2, 1984, at the Minnesota State Fairgrounds, St. Paul. Admission is $4.00. There will be free overnight parking for self-contained campers on June 1st. Features will include exhibits, booths, and a giant outdoor flea market. Talk-in on .25/.85 and .16/.76. For more information, write Amateur Fair, PO Box 857, Hopkins MN 55343, or call (612)-420-6000.

### PITTSBURGH PA
### JUN 3

The 30th annual Breeze Shooters Hamfest will be held on Sunday, June 3, 1984, from 9:00 am to 4:00 pm, at the White Swan Amusement Park, PA Rte. 60 (Parkway West), near the Greater Pittsburgh International Airport. Registration is $2.00 or 3 for $5.00. Sheltered tables for vendors are available by advance registration only. Admission and flea-market spaces are free. There will be food available and activities will include the family amusement park. Talk-in on .28/.88 and 29 MHz. For further information, please write Don Myslewski K3CHD, 359 McMahon Road, North Huntingdon PA 15642, or phone (412)-863-0570.

### ROME NY
### JUN 3

The Rome Radio Club, Inc., will present the 32nd edition of its Rome Ham Family Day on Sunday, June 3, 1984, at Beck's Grove, Rome NY. Activities will include games, contests, educational and scientific displays and presentations, and a large flea market. Good food and beverages will be available throughout the day, which will be climaxed by a dinner and the Ham-of-the-Year award.

### MANASSAS VA
### JUN 3

The Ole Virginia Hams ARC, Inc., will hold the tenth annual Manassas Hamfest on Sunday, June 3, 1984, beginning at 8:00 am, at Prince William County Fairgrounds, VA Route 234, ½ mile south of Manassas VA. Admission is $4.00 per person (children under 12 will be admitted free) and there will be no advance sales. Activities will include 25 acres of tailgating (setups at 7:00 am), indoor commercial exhibits, breakfast and lunch menus, a YL program, and CW proficiency awards. Talk-in on 146.37/.97 WA4FPM (Manassas repeater) and 146.52 simplex. For more information, write Hamfest, c/o Ole Virginia Hams ARC, Inc., Manassas VA 22110, or phone (703)-361-9468.

### CHELSEA MI
### JUN 3

The Chelsea Swap and Shop will be held on Sunday, June 3, 1984, from 8:00 am to 2:00 pm, at the Chelsea Fairgrounds, Chelsea MI. The donation is $2.50 in advance and $3.00 at the gate. Children under 12 and non-ham spouses will be admitted free. Table space is $7.00 per 8 feet (ladies' tables welcome) and trunk sales are $2.00 per space; gates will open for sellers at 5:00 am. There will be plenty of parking, including special parking for the handicapped. Talk-in on 146.52 simplex and the 147.855 Chelsea repeater. For more information, write William Altenberndt WB8HSN, 3132 Timberline, Jackson MI 49201, or phone (517)-764-5785.

### BOWLING GREEN KY
### JUN 9

The Kentucky Colonel Amateur Radio Club will hold its 2nd annual hamfest on June 9, 1984, from 8:00 am to 3:00 pm, at the JC Pavilion at the Southern Kentucky Fairgrounds, Bowling Green KY. Tickets are $2.00 in advance and $3.00 at the door. Features will include an inside and outside flea market, inside displays of new equipment, food, free coffee, and free parking. Talk-in on 146.25/.85 and 146.52 simplex. For further information, write Ed Gann N4HID, Box 92, Route 19, Bowling Green KY 42101, or call (502)-843-8911.

### KINGSTON PA
### JUN 3

The Murgas ARC (K3YTL) will sponsor the annual Wilkes-Barre Hamfest on Sunday, June 3, 1984, beginning at 8:00 am, rain or shine, at the 109th Armory, Market Street, Kingston (across the river from Wilkes-Barre). Admission is $3.00; children under 16 and XYLs will be admitted free. There will be indoor and outdoor tailgating at $2.00 per space. Setups only will be at 6:00 am and tables and commercial power will be available. Talk-in on 146.01/.61 and .52 simplex. For further information, write Hamfest Committee, PO Box 1094, Wilkes-Barre PA 18703.

### SOUTHINGTON CT
### JUN 3

The Southington Amateur Radio Association will hold a flea market on Sunday, June 3, 1984, at the Central Elementary School, Main Street (Route 10), just outside Southington Center. Take exit 32 from I-84 to Route 10 south for 1.4 miles. The school is on the right, across from the Public Library. Admission is $1.00. Tables are $7.00 each in advance and $8.00 each at the door (no tailgating); two people will be admitted with each table purchased. There will be over 30 tables of new and used ham equipment, and hot coffee and refreshments will be available. Talk-in on 146.28/.88 and 145.550 simplex. For a table reservation, send an SASE and check (payable) to SARA, PO Box 284, Southington CT 06489.

### PRINCETON IL
### JUN 3

The Starved Rock Radio Club (W9MKS) will present its annual hamfest on June 3, 1984, at the Bureau County Fairgrounds in Princeton IL. Registration is $2.50 in advance (before May 20) and $3.00 at the gate. There will be a nominal fee for recreational vehicles. Features will include a free swap area, commercial vendor exhibits, an ARRL seminar, and plenty of parking. Good food will be available. Registrants will receive free coffee and doughnuts at 8:00 am. Talk-in on 147.12/.72, 146.07/.67, and 146.52 simplex. For advance registration or more information, send a large SASE to SRRC/W9MKS, RFD #1, Box 171, Oglesby IL 61348, or phone (815)-667-4614.

### COEUR D'ALENE ID
### JUN 9

The Kootenai Amateur Radio Society will sponsor Hamfest '84 on June 9, 1984, from 8:00 am to 4:00 pm, at the North Idaho Fairgrounds, Coeur D'Alene ID. Swap tables will be available at no charge; RVs are welcome but no hookups will be available on site. The annual Friday program will include a pot luck supper and dancing afterwards. For further information, write Avon Anderson WB7WBZ, N. 1035 Highland Court, Post Falls ID 83854.

### WILLOW SPRINGS IL
### JUN 10

The Six Meter Club of Chicago, Inc., will hold its 27th annual hamfest on Sunday, June 10, 1984, at Sante Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of downtown Chicago). Registration is $2.00 in advance and $3.00 at the gate. Gates will open at 6:00 am and features will include a large swappers' row, displays in the pavilion, an AFMARS meeting, picnic grounds, refreshments, and plenty of parking space. Talk-in on 146.52 (K9ONA) and .37/.97 (K9ONA/R). For advance tickets, contact Val Hellwig K9ZWV, 3420 South 60th Court, Cicero IL 60650.

### DEAL NJ
### JUN 10

The Jersey Shore Chaverim will sponsor the third annual Ham & Computer Fest on June 10, 1984, from 9:00 am to 4:00 pm, at the Jewish Community Center, 100 Grant Avenue, Deal NJ (less than 50 miles from NYC and 70 miles from Philadelphia). Admission is $3.00 per person and children under twelve and XYLs will be admitted free. Indoor tables are $8.00 and tailgating spaces are $3.50 each. For reserved spaces, send an SASE and payment by June 1st to Jersey Shore Hamfest, PO Box 192, West Long Branch NJ 07764. Talk-in on 147.045 + .6, 145.110 – .6, and 146.52 simplex. For more information, call Arnold W2GDS at (201)-222-3009.

### CORTLAND NY
### JUN 16

The 2nd annual SARC Hamfest and

Flea Market will be held on Saturday, June 16, 1984, from 8:00 am to 5:00 pm, rain or shine, at the Cortland County Fairgrounds, Cortland NY (Exit 12 off I-81, midway between Syracuse and Binghamton). The donation is $2.00 and jr. ops under 12 and XYLs will be admitted free. Indoor tables and spaces are $3.00 each and undercover (pole-barn) spaces are $2.00 each. There will be indoor and outdoor flea markets, acres of free parking, and refreshments. Talk-in on .52 simplex. For table and space reservations, send a check to Elmer Fuller, Treasurer, 129 Chelsea Twins, Cortland NY 13045. For more details, contact Bud Jackson K2ZER, Skyline Amateur Radio Club, 8 Sunnyfield Drive, Cortland NY 13045.

**FREDERICK MD**
**JUN 17**

The Frederick Amateur Radio Club will hold its 7th annual hamfest on June 17, 1984, from 8:00 am to 4:00 pm, at the Frederick Fairgrounds. Admission is $3.00 and YLs and children will be admitted free. Tailgaters will be charged an additional $2.00; exhibitors' tables are $10.00 for the first and $5.00 for each additional one. Gates will open for exhibitors at 8:00 pm on June 16, 1984, and overnight security will be provided. Overnight parking will be welcomed. For further information, write Jim Devilbiss WA3FUJ, 915 Pine Avenue, Frederick MD 21701, or phone (301)-662-5784.

**LAS VEGAS NV**
**JUN 21-24**

The YL International Single Sideband System's annual convention will be held on June 21-24, 1984, at the Sahara Hotel, Las Vegas NV. Deluxe accommodations and RV parking are available for reasonable rates. Planned activities include a tour of Hoover Dam, a Lake Mead cruise, a gala stage show, a cocktail party, a banquet, and a breakfast buffet, as well as the DX forum and business meetings. YLRL ladies are invited to meet Thursday evening, June 21, at 8:00 pm. A convention station will be operating on 14,332 kHz. For complete details and a registration packet, send a business-size SASE (37¢ postage) to Jan Weaver N7YL, 2195 East Camero Avenue, Las Vegas NV 89123.

**LIVONIA MI**
**JUN 29-30**

The Livonia Amateur Radio Club will host the 1984 ARRL Michigan State Convention on June 29-30, 1984, on the campus of Schoolcraft College, 18600 Haggerty Road at Seven Mile Road, Livonia MI (22 miles northwest of downtown Detroit). Schoolcraft is easily accessible via interstates 75, 275, 96, or 94. The Swap-N-Shop will be in the main gymnasium, and one of the two parking lots will be set aside for trunk sales. Major exhibitors will be in the swap area, if requested. Exhibitors' setups will be on Friday, June 29th, from 12:00 noon until 10:00 pm, and the displays will be open on Saturday, June 30th, from 8:00 am until 5:00 pm. There will be security provided on Friday night. For more information, write Wayne W. Wiitse K8BTH, General Chairman, 1984 ARRL Michigan Convention Committee, 14468 Bassett Avenue, Livonia MI 48154.

**SWIFT CURRENT SASK**
**JUN 30**

The Saskatchewan Hamfest will be held on June 30, 1984, in Swift Current SASK. Registration will be the evening before. Features will include contests, displays, a ladies' program, and a banquet. For more details, contact the Saskatchewan Hamfest Committee, Box 6, Swift Current SASK S9H 3V5, Canada.

**OAK CREEK WI**
**JUL 7**

The South Milwaukee Amateur Radio Club will hold its annual swapfest on Saturday, July 7, 1984, from 7:00 am to approximately 5:00 pm, at the American Legion Post #434, 9327 South Shepard Avenue, Oak Creek WI 53154. Admission is $3.00 per person and includes a "Happy Hour" with free beverages. Parking, a picnic area, hot and cold sandwiches, and liquid refreshments will be available. There will be free overnight camping. Talk-in on 146.94 MHz FM. For more details, including a local map, write South Milwaukee Amateur Radio Club, PO Box 102, South Milwaukee WI 53172.

**BOISSEVAIN MAN CAN**
**JUL 14-15**

The 21st annual International Hamfest will be held on July 14-15, 1984, at the International Peace Garden between Dunseith ND and Boissevain MAN. Activities will include transmitter hunts, mobile judging, and a CW contest. Excellent camping facilities will be available. For more information, contact William W. Bosch WD0EMY or Stanley E. Kittelson WD0DAJ, Box H, Dickinson ND 58601.

**LOUISVILLE OH**
**JUL 15**

The Tusco Amateur Radio Club (W8ZX) and the Canton Amateur Radio Club (W8AL) will present the 10th annual Hall of Fame Hamfest on Sunday, July 15, 1984, at the Nimishillen Grange, 6461 Easton Street, Louisville OH. Admission is $2.50 in advance and $3.00 at the gate. Tables are for rent on a reserved basis. Talk-in on 146.52/.52 and 147.71/.12. For reservations or more information, write Butch Leboid WA8SHP, 10877 Hazelview Avenue, Alliance OH 44601, or phone (216)-821-8794.

**LAPORTE IN**
**JUL 15**

The combined LaPorte-Michigan City Amateur Radio Clubs will sponsor their Summer Hamfest on Sunday, July 15, 1984, from 8:00 am to 2:00 pm, at the LaPorte County Fairgrounds, State Road 2, west of LaPorte IN. The donation is $3.00 at the gate. Good food, cold drinks, and paved outdoor parking will be available. For reservations for indoor tables (40¢/foot), write PO Box 30, LaPorte IN 46350.

**GLACIER PARK MT**
**JUL 20-22**

The Great Falls Area ARC will present the 50th annual Glacier-Waterton International Hamfest on July 20-22, 1984, at Three Forks Campground on the southern edge of Glacier National Park. Pre-registration is $8.50 and includes Saturday-night dinner (bring own meat and utensils) and Sunday-morning breakfast. Talk-in on .52 and .34/.94. For more information, send an SASE to Shirley Smith KC7OA, 1822 14th Avenue South, Great Falls MT 59405.

**BEAVERTON OR**
**JUL 27-29**

The Willamette Valley DX Club will hold the 1984 DX Convention on July 27-29, 1984, at the Greenwood Inn, Beaverton OR. For further information, write Bob Herndon W7XN, 607 Andover Place, Portland OR 97202, or phone (503)-232-2740.

**HOUGHTON MI**
**JUL 28**

The Copper Country Radio Amateur Association will host the 1984 Upper Peninsula Hamfest on July 28, 1984, at the Memorial Union Cafeteria on the campus of Michigan Technological University, Houghton MI. For further information, write Howard Junkin N8FHF, Co-Chairman, UP Hamfest, 106 West South Street, Houghton MI 49931, or phone (906)-482-4630.

**WEST FRIENDSHIP MD**
**JUL 29**

The Baltimore Radio Amateur Television Society (BRATS) will present the BRATS Maryland Hamfest and Computerfest on Sunday July 29, 1984, at the Howard County Fairgrounds, Route 144 at Route 32, adjacent to Interstate 70, West Friendship MD, about 15 miles west of the Baltimore Beltway (695). Table sales are by advance reservation only; indoor tables along the wall with ac are $20.00 each and indoor tables in the center of the floor without ac are $10.00 each. Quantity discounts and booths are available. There will be plenty of outdoor tailgating and RV hookups will be available. Dealer setups begin Saturday at 2:00 pm with overnight security provided. Talk-in on 146.76 (−600), 147.03 (+600), and .52 simplex. For table reservations and more information, write BRATS, PO Box 5915, Baltimore MD 21208, or call Mayer Zimmerman W3GXK at (301)-655-7812.

**LAFAYETTE IN**
**AUG 19**

The Tippecanoe Amateur Radio Association will hold its 13th annual hamfest on Sunday, August 19, 1984, beginning at 7:00 am, at the Tippecanoe County Fairgrounds, Teal Road and 18th Street, Lafayette IN. Tickets are $3.00. Features will include a large flea market, dealers, and refreshments. Talk-in on .13/.73 and .52. For advance tickets and more information, write Lafayette Hamfest, Route 1, Box 63, West Point IN 47992.

**CHEROKEE OK**
**AUG 26**

The 2nd annual Great Salt Plains Hamfest will be held on August 26, 1984, from 9:00 am to 5:00 pm, at the Community Building on the south side of the Great Salt Plains Lake in north-central Oklahoma. Features will include technical forums, organizationals meetings, free swap tables, refreshments, Novice exams, and a noon pot-luck dinner. Overnight camping and RV hookups are available at the Lakes State Park. Talk-in on the 147.90/.30 Salt Plains repeater. For more information, write Steven Walz WA5UTO, Box 222, Cherokee OK 73728, or phone (405)-596-3487.

**PARAMUS NJ**
**OCT 14**

The Bergen ARA will hold a Ham Swap 'n' Sell on October 14, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only; bring your own table. Admission for sellers is $4.00; buyers will be admitted free. Thousands of spaces will be available. Talk-in on .79/.19 and .52. For more information, write Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855, evenings only.


Rochester HAMFEST

ATLANTIC DIVISION/NY STATE
ARRL CONVENTION

SATURDAY, MAY 19
MONROE COUNTY FAIRGROUNDS

ROUTE 15A

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**WANTED**—your unused Teletype™ repair parts. High prices paid! Send SASE for list of Teletypewriter parts and supplies. TYPETRONICS, Box 8873, Fort Lauderdale FL 33310; (305)-583-1340 after 9:00 pm. N4TT. BNB052

**WANTED:** Old keys for my telegraph and radiotelegraph key collection. Need pre-1950 bugs. All models of Vibroplex, Martin, Boulter, Abernathy, McElroy, etc. Also need Spark keys, Boston keys, large or unusual radiotelegraph keys, sideswipers, cooties, homebrew, and foreign keys. Neal McEwen K5RW, 1128 Midway, Richardson TX 75081. BNB063

**WE ENJOY** creating ham plaques, trophies, awards. Pse QSO. Prices, shipping—low. Care—free. J & J Trophy, Grove Street, Peterborough NH 03458; (603)-924-7804. BNB065

**WANTED:** Pre-1950 TV sets and old *TV GUIDE* magazines. W3CRH, Box 20-S, Macomb IL 61455; (309)-833-1809. BNB066

**WANTED:** Military surplus radios. We need Collins 618T, ARC-72, ARC-94, ARC-102, RT-712/ARC-105, ARC-114, ARC-115, ARC-116, RT-823/ARC-131 or FM622, RT-857/ARC-134 or Wilcox 807A, ARC-159, RT-1167 or RT-1168/ARC-164, RT-1299/ARC-186, RT-859/APX-72, APX-76, ARN-82, ARN-84, ARN-89, RT-804/APN-171, RT-829/APN-171, MRC-95, 718F-1/2, HF-105, Collins antenna couplers, 490T-1, 490T-2, 490T-9, CU-1658A/ARC, CU-1669/GRC, 490B-1, CU-1239/ARC-105, 490D-1. Top dollar paid or trade for new amateur gear. Write or phone Bill Slep, (704)-524-7519, Slep Electronics Company, Highway 441, Otto NC 28763. BNB071

**1984 WIRE & CABLE** prices cut!!! Call or write for latest listings. Certified Communications, "The CB to 10 Meter People," 4138 So. Ferris, Fremont MI 49412; (616)-924-4561. BNB073

**KQ6P NOVICE EXAM KIT.™** FCC no longer supplies written test! The Novice Exam Kit provides everything you need to give the Novice exam including . . . 3 multiple-choice written exams . . . 6 code tests on cassette (3 tests using 5-wpm characters and 3 tests using 13-wpm characters) . . . all FCC forms (610 and PR1035A) . . . plus "Instructions and Helps for the Examiner." Only $5.95 (plus $1.00 shipping) from Spirit Publications, 2200 El Camino Real Suite 107, Redwood City CA 94063. Discount to clubs! BNB076

**SAN ANTONIO, TEXAS, QTH FOR SALE.** 4-2-2 with 70-foot tower, etc. W8CM, (512)-684-6129. BNB077

**TI99/4a RTTY.** Mini-memory required. Mark and space tones are internally generated in send mode. TU is needed for receive-only. $17.95. Mark Schmidt, 4661 Lark Dr., Beale AFB CA 95903. BNB078

**"FOOLPROOF LOGGING"** program described in November, 1983, 73 magazine available for TRS-80 Model III, IBM PC, and CP/M-80 computers using Microsoft BASIC. $35.00 for diskette, manual, ppd. "Super-log" written in dBASE-II source code for almost any computer, $50.00. Specify disk format. Write for details. GRF Computer Services, 6170 Downey Avenue, Long Beach CA 90805. BNB079

**DIGITAL DISPLAYS** for FT-101s, TS-520s, Collins, Drake, Swan, and others. Write for information. Grand Systems, PO Box 3377, Blaine WA 98230; (604)-530-4551. BNB084

**KV4/KP2 STATION, ST. THOMAS.** Contests/DX/vacations, singles/clubs. Paul Murray WA2UZA, RD 4, Princeton NJ 08540; (201)-329-6309. BNB085

**STOP!! SUPER SAVINGS!** Kenwood R-2000, $499.50; R-1000, $409.50; FRG-7700, $429.50; Sony 2002, $225.50; Panasonic RF-B300, RF-B600, call!! Uniden CR-2021, $209.50; Regency HX-1000, HX-3000, MX-5000, MX-7000, in stock—call!! Bearcat BC-100, $288.50; BC-250, $249.50; BC-300, $359.50. Frequency directories, cordless phones, rotors, coax, antennas, much, much more!! Free UPS shipping and insurance to 48 states. 25-page picture catalog, $1.00 (refundable). Galaxy Electronics, Box-1202--, 67 Eber Ave., Akron OH 44309; (216)-376-2402, 9:00-5:00 pm EST. BNB087

**EMERGENCY COMMUNICATIONS**—An Organizational and Operational Handbook, by K3PUR. A complete reference guide for ARES/RACES and other public service groups, as reviewed in December '83 *QST* and January '84 *CQ*. $9.95 plus $1.50 P/H to: FDW Arts, 1394 Old Quincy Lane, Reston VA 22090 (VA residents, add 4% tax). BNB089

**DX HEADING MAPS** for Boston, NYC, Philadelphia, Baltimore, Detroit, Atlanta, Chicago, New Orleans, St. Louis, Dallas, LA. 11″×17″, $1.75 pp. 22″×34″, $5.95 pp. Specific city. Massey, PO Box 397, Hainesport NJ 08036; (609)-261-2952. BNB094

**COMMODORE 64 CW INSTRUCTOR PROGRAM.** Generates CW on TV speaker. Random code, keyboard input, or pre-recorded "CW tests." Character speed and spacing set independently. Designed for classes and increasing code speed. $15.00—diskette or cassette (specify). Dennis Oliver N7BCU, 20909 S. Ferguson Rd., Oregon City OR 97045. BNB095

**STATE-OF-THE-ART,** rugged, low-profile antenna systems. Helical designs from 3.5 to 50 MHz. DDRRs from 144 to 450 MHz. Refer to 73 magazine reviews in October and November, 1982. Com-Rad Industries, 25 Imson Street, Buffalo NY 14210; (716)-773-1445. BNB096

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**FREE FREE GIFT.** Interested in amateur radio, computers, video? Large SASE pse and mention *73* magazine. Free gift to all. Narwid Electronics, 61 Bellot Road, Ringwood NJ 07456. BNB098

**FIND OUT** what else you can hear on your general-coverage transceiver or receiver. Complete information on major North American radio-listening clubs. Send 25¢ and SASE. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier CA 90601. BNB099

**SULTRONICS** offers TET antenna systems with factory backup and parts. Call or write for our complete catalog with full descriptions and specs on the full line of TET antennas—the best! For fast and friendly service as usual, contact Dan WD8IDZ or Nina N8ANU at Sultronics Amateur Radio, 15 Sexton Drive, Xenia OH 45385; (513)-376-2700. BNB102

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**COLLINS:** 32S-3, 75S-3B, 30L-1, more. Also Hy-Gain TH6DXX, rotator, tower. Make offer. WA7WOC, (602)-867-2378, evenings. BNB105

**ELECTRONIC AVOCATIONS™.** Nonprofit service promoting radio hobbies. SASE. Arnold Timm, 2308 Garfield #304, Minneapolis MN 55405. BNB106

**SECURITY ALARM** Industry booming. Get in now. Tremendous demand. Employment business terrific. Information pack, $2.00. Security Electronics International, PO Box 1456-TW, Grand Rapids MI 49501. BNB107

**VHF+ TRADING POST:** Buy, sell, trade your VHF, UHF, and microwave equipment and accessories. SASE for sample. 1420 East Sweet Avenue, Bismarck ND 58501. BNB108

**ICOM SALE**—IC-740 with PS-740, new condition, $850. IC-22A 2-meter transceiver with Hustler collinear antenna, $175. W. M. Stobbe W3KDT, 914 Plymouth Place, Turnersville NJ 08012. BNB109

**FM SERVICE MANUALS**—RCA, GE, Motorola, Aerotron, Alpha, Johnson, Kaar, DuMont, others. Reasonable. Send exact model and description. T. McLaughlin, PO Box 411, Mango FL 33550. BNB110

**COLLINS 516F-2** ac power supplies for sale, $135, used, reconditioned. Also have a few with bad power transformers and bent cases that I will sell for parts. Collins 618S-1 aircraft radio, $200. Victor Frank K6FV, 12450 Skyline Blvd., Woodside CA 94062; (415)-851-1570. BNB111

**FOR SALE:** Tektronix 2215 oscilloscope, used once, $1200. RM1 Kevin Laman, PO Box 9058, NAS Key West FL 33040. BNB112

**WANTED:** Old keys for my telegraph and radiotelegraph key collection. Need pre-1950 bugs. All models of Vibroplex, Martin, Boulter, Abernathy, Shawplex, etc. Also need Spark keys, Boston keys, sideswipers, unusual keys, Omnigraphs, Cricket and Bunnell miniatures. Neal McEwen K5RW, 1128 Midway, Richardson TX 75081. BNB113

**RADIO SPECIALTIES** FM deviation scope—$250; Narda 8400 rf power meter, .01–12.4 GHz—$95; Singer M-19 spectrum analyzer, 1 kHz–25 MHz—$150. K6KZT, 2255 Alexander, Los Osos CA 93402. BNB114

**COLLECTOR'S DREAM**—Remember the "Morrow Twins?" Vintage 1956! Very rugged, high-performance AM/CW mobile (or quick slide-out for base use or theft protection). Xtal/vfo (Clapp) transmitter (6146 final). Stacked matching receiver (Clapp bfo), 10 through 75 meters, ham bands only. Full dial bandspread. Husky center-load remote-tuned whip. Cost a bundle. Never used! Absolutely new condition! Includes dynamotors. Open for bids on these "jewels." Dick Grimm (ex-W3TRS), 10 Latisquama Rd., Southboro MA 01772; (617)-481-0458. BNB115

**IF YOU'RE ON 220,** subscribe to *220 NOTES*. Write to *220 NOTES*, Dept. 10, 215 Villa Rd., Streamwood IL 60103. BNB116

**REPAIR,** alignment, calibration. Collins written estimates, $25; non-Collins, $50. K1MAN, (207)-495-2215. BNB117

**WANTED:** Hallicrafters PS 150–120 power supply. For sale: Heathkit HP 23 power supply. Send SASE. R. Goodpaster, 415 Harmon Hts., Stanford KY 40484. BNB118

# HAM HELP

I am looking for a 3-inch-square meter that was used in the Collins 302C3 wattmeter. Also a Collins 75S3A.

**Max R. Otto W9LFF**
**733 West Benton Street**
**Iowa City IA 52240**

I am requesting any information on Tesla coils. I need this for a science project. Any articles on how to build a Tesla coil will be greatly appreciated.

**Kent Barrett**
**141 Gatone Drive**
**Hendersonville TN 37075**

I am looking for a synthesizer compatible with a Heathkit HW-202 2m FM transceiver. Xtals are Freq./24 for Tx and Freq. – 10.7/3 for Rx. I am also looking for a Drake FS-4 synthesizer. Any manuals available for such devices would also be appreciated.

**Allen Cole N4JRI**
**PO Box 11282**
**Richmond VA 23230-1282**

Regarding CB to 10 meters: I would like information on the conversion of a Pace-Sidetalk 1000M.

**L. Latham N5FJK**
**2500 Flamingo Lane**
**Altus OK 73521**

I need a schematic or other info for a Simpson 260 series 5 and series 3A, RCA WV77E, and EICO 232. I will pay shipping and copying costs.

**Fred "Al" Wasielewski WA2VJL**
**PO Box 1382**
**San Benito TX 78586**

Hammarlund HX-50 or 50A SSB transmitter: Looking for info on 160-meter kit, part #PL26860-G1 or G2, which adds 160 meters to this rig. Will consider junked HX-50 or 50A with 160 meters installed, as parts source.

**John F. Sehring WB2EQG**
**PO Box 1872**
**Wayne NJ 07470**

Need schematic and/or manual for AM-COM S 2-25 2m xcvr. Will pay all expenses.

**Manos G. Darkadakis SV1IW**
**Box 23051**
**112 10 Athens, Greece**

I am looking for help with the problem of interfacing a Heath SS-9000 transceiver with a VIC-20 or Commodore 64. I have an RS-232 interface on the computer and have configured it as follows:

RS-232 Serial Output to Soutput on 9000
RS-232 Serial Input to Sinput on 9000
Request to send to Clear to send on 9000
Data terminal ready to Data set ready on 9000
Data set ready to Data terminal ready on 9000
Signal ground to signal ground

I am using Victerm 1 software, and needless to say, this configuration is not working. I live on the desert here in California and am about 150 miles from San Diego and 200 miles from Los Angeles. There are no users groups anywhere around this area, so I don't know where to turn for help.

I am willing to pay any reasonable charge for help with this matter.

**Dick Hern N6IUK**
**PO Box 1014**
**Brawley CA 92227**

I would like to contact other hams who have what I term "sophisticated" computerized RTTY—programs that emulate fancy dedicated equipment (e.g., Hal 3100, etc.) and allow mailbox ops, the sending of a file to/from disk, etc. Info on such programs and their resident computers and required interfacing would be most greatly appreciated.

I am interested both for my own personal info (i.e., purchase) and because there is no single source of data on what is available for which computer and what the capabilities and limits are. I intend to compile and publish that source.

**John Palese WB8JPH/5**
**314 Cedar Bend Drive**
**Midwest City OK 73130**

I need a schematic for a Commodore VIC-20 computer. I'll pay any reasonable charge.

**Warren J. Koppy WB8KIS**
**903 Mound Street**
**St. Paul MN 55106**

I need a schematic for a Radio Mfg. Engineers, Inc., serial no. CM1 receiver. I will pay for copying costs.

**Ron Janeshek**
**RD #1**
**Bulger PA 15019**

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## CHOOSING A PROGRAMMING LANGUAGE

Computer users are always debating which programming language is best. In my opinion, it is impossible to say which one is "best." While I tend to use PL/I-80 by Digital Research for most of my programming needs, I certainly would not use it for everything. For some applications, particularly for short programs that are used once to perform a mathematical calculation, Basic is the best choice. For many amateur-radio and electronics applications, programs are written and run only once to calculate a particular value. Once the needed value is obtained, the program will never be run again.

The traditional way of comparing languages is through the use of a benchmark—taking the same algorithm and translating it into a number of different languages. The execution times (how long it takes to run) are then compared and the fastest one is considered the best. Unfortunately, this method doesn't take the amount of time needed to *write* the program into account. Also, some languages are fast while doing one type of calculation and slow for another. PL/I-80 provides a good example of this! For binary calculations it is extremely fast, but when dealing with BCD or floating-point numbers, it creeps.

To demonstrate that execution times alone are not a good way of comparing languages, I have put together a benchmark comparison of 7 programming languages: four versions of Basic and one each of Pascal, PL/I-80, and Cobol. In this comparison, I have recorded the amount of time it took to write the program, from the moment I sat down at the keyboard to the end of the first working run. I also did another sneaky thing: I purposely chose a problem that is not efficiently calculated in microcomputer implementations of Pascal, PL/I, and Cobol.

### Basic

The Basics I used were Applesoft, Microsoft Basic-80 (running under a 2-MHz CP/M system), Atari Basic, and T.A.S.C. (a compiled Applesoft marketed by Microsoft). The program, which calculates the sum of the integers from 1 to 1000, is shown in Listing 1. Line 10 is there to permit timing—timing starts when RETURN is hit in response to the INPUT statement and stops when the result appears on the display. (In the Atari version, I added "5 DIM A$(1)". This was needed because Atari Basic handles strings differently.)

Writing time for Applesoft, Microsoft, and Atari Basics were close, at 38, 44, and 50 seconds respectively. Execution times were 3.71 seconds for Applesoft, 6.01 seconds for Microsoft Basic-80, and 5.75 seconds for Atari Basic. It is interesting to note that although the Atari's 6502 MPU runs at 1.8 MHz as compared with Apple's 1.024-MHz clock, Atari Basic is *slower* by a factor of 64%. This example shows that CPU speed isn't always a good criterion with which to compare computers.

T.A.S.C., which stands for The AppleSoft Compiler, had a "writing time" of 2 minutes, 7 seconds. The extra time is because the compiler checks the program's syntax and converts it to machine language *before* any code is actually executed. In contrast, Basic interpreters (i.e., Applesoft) check syntax and execute the code a line at a time. Benefits are realized at execution time; the program took only 1.56 seconds to execute—237% faster than Applesoft and 385% faster than Microsoft Basic-80!

```
10 INPUT A$
20 FOR X = 1 TO 1000
30 S = S + X
40 NEXT X
50 PRINT S
```

*Listing 1. Basic.*

```
PROGRAM ADD;

    VAR SUM:INTEGER[6];
        IDX:INTEGER;
        X  :CHAR;


     BEGIN (*ADD*)

       READLN (X);

       SUM := 0;

        FOR IDX := 1 TO 1000 DO
           SUM := SUM + IDX;

       WRITELN (SUM)

     END.
```

*Listing 2. Pascal.*

```
add:proc options (main);


    dcl x fixed decimal (10,0);
    dcl sum fixed decimal (10,0);
    dcl f char(1);


    get list (f);
    sum = 0;

    do x = 1 to 1000;
     sum = sum + x;
    end;

    put skip list (sum);
end add;
```

*Listing 3. PL/I-80.*

```
IDENTIFICATION DIVISION.
PROGRAM-ID. ADD.
ENVIRONMENT DIVISION.
DATA DIVISION.
WORKING-STORAGE SECTION.
77 IDX PICTURE 9999.
77 SUM PICTURE 999999.
77 X   PICTURE X.
PROCEDURE DIVISION.
BEGIN.
    ACCEPT X.
    MOVE ZERO TO IDX.
    MOVE ZERO TO SUM.
    PERFORM ADD-PAR UNTIL IDX = 1001
    DISPLAY SUM.
    STOP RUN.
ADD-PAR.
    COMPUTE SUM = SUM + IDX.
    ADD 1 TO IDX.
```

*Listing 4. Cobol.*

Which Basic is best? Certainly, the compiled version is the fastest as far as execution time. However, it took much longer to get the program ready for execution. For this reason, when writing a program to perform a calculation that has to be done once, a compiled Basic is not worth the extra effort. On the other hand, if you have to do a few hundred calculations, the additional speed would be an advantage.

### PL/I, Pascal, and Cobol

Because they are compiled, PL/I, Pascal, and Cobol would suffer from the same disadvantages as T.A.S.C. This is not too surprising. What is surprising is that all three of them were slower in *execution* speed than Applesoft Basic. In fact, PL/I and Cobol were slower than Basic-80.

Listing 2 shows the Pascal version of the program. Notice that it took 11 lines as compared to Basic's 5 lines, making it 220% longer. It took 5 minutes, 7 seconds to write, compile, and run the program; execution time alone was 4.52 seconds. The version of Pascal I used was UCSD Pascal version 1.1 running on a 2-MHz Z-80 computer. UCSD Pascal is not a true compiler. It converts the program into an intermediate language called P-code, which is then interpreted.

Don't get the idea that Pascal isn't a good language. It contains many features that would be difficult, if not impossible, to code in Basic. It also allows for elaborate records, structures, and sets. Unlike Basic, it is a fairly standard language. I can give the program in Listing 2 to almost any Pascal compiler and it would run with no difficulty.

PL/I-80 produced some disappointing results (Listing 3). It took 4 minutes, 49 seconds to write, compile, link, and run the program. Execution time alone was 8.13 seconds, slower than the slowest Basic (Basic-80) in our benchmark.

The PL/I-80 compiler is marketed by Digital Research and is my favorite microcomputer language. It is not efficient when calculating fixed-point binary numbers—usually about 35 times faster than the best Basics. Unfortunately, fixed-point binary numbers must be in the range of −32768 to +32767. This is not enough for our benchmark program, which produces a result of 500500. The size of this result forced me to use fixed decimal numbers (which are not computed as efficiently), slowing the program down considerably.

Another factor that slowed PL/I-80 is the nature of the language. PL/I-80 allows mixing of types. For example, the statement T=T+'1' is perfectly valid—the string constant '1' is converted into a number and added to T. The ability to convert from one type (string) to another type (numeric) adds considerable overhead to PL/I programs and, not surprisingly, slows them down. It is these same time-wasting features that can be lifesavers in many programming applications and make for more efficient programs.

The slowest language in our benchmark is Cobol-80 made by Microsoft. Cobol is a business language and is best at file handling and printing tables of decimal numbers. Speed in calculation is not one of Cobol's strong points.

Writing, compiling, linking, and running the Cobol program in Listing 4 took 9 minutes and 27 seconds. Execution time alone was 22.45 seconds—373% slower than the Basic-80 and 1439% slower than T.A.S.C. It is clear that Cobol-80 is not a good choice for numerical calculation. However, when working with data files or printing out financial reports, paychecks,

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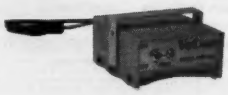

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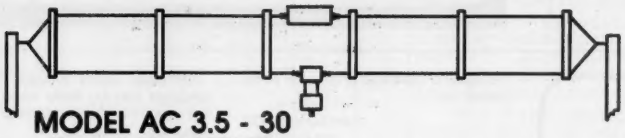

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or accounts receivable, it is a good choice.

**Conclusions**

Which language is best? As you can see, it is hard to answer that question. You've probably heard that Pascal is "better" than Basic, or that PL/I-80 is the fastest compiled language for microcomputers, but as you can see from benchmark results, this is not always the case. In general, for a long program, PL/I or Pascal will execute faster than any Basic. However, when writing a program to do a specific mathematical calculation, Basic is often the best choice. It is certainly quicker to get a Basic program running than a PL/I program—no compiling or linking is necessary.

Incidentally, the best choice is sometimes no computer program at all! Let's take another look at the problem solved by our benchmark program: finding the sum of the numbers from 1 to 1000. The program calculates this by adding $1+2+3+4+\ldots+1000$. However, it can also be looked at as adding $(1000+1)+(999+2)+(998+3)+\ldots+(501+500)$. You'll notice that the number within the parentheses always adds up to 1001, and you are adding this to itself 500 times. By multiplying 1001 by 500, which can easily be done in one's head, one comes up with 500500. The same method can be used to find the sum of any other series of numbers. For example, the sum of the integers from 1 to 250 is equal to 251 times 125, or 31375.

When I first discussed programming languages a few months ago, I was surprised by the amount of interest the subject generated; my post-office box was overflowing! I hope this column clears up some of the mystery surrounding the various languages available to the microcomputer user.

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Send your request to: R. V. Tetrick, Head, Project Operations Branch, NASA, Goddard Space Flight Center, Greenbelt MD 20771. (Thanks to Carl S. Zelich AA4MI for this information.)

# CORRECTIONS

Herewith a revised negative for the circuit board in the article ("Build the NASA Beeper") which I sent to you and which was published on page 88 of the March, 1984, issue of *73*. In checking the proofs of the board, I inadvertently compared it to a different earlier negative which was in error. Please accept my apologies.

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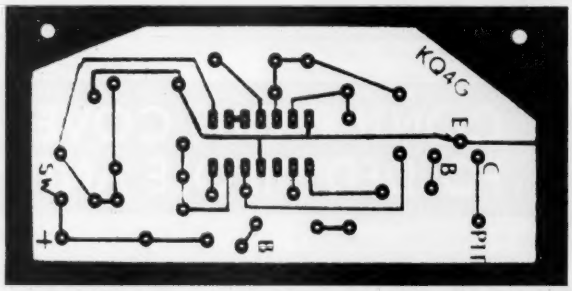


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**Jim Turner K5YZS**
**103 Karla Drive**
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# AWARDS

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## TEN-METER FM AWARDS

Sponsored by the North Whidbey Island Repeater Association (NWIRA).

All contacts, to be valid, must have been made on or after January 1, 1981. Crossmode contacts do not count. Contacts must be 2-way ten-meter FM.

Special endorsements can be made for all-mobile, all-simplex, and single-frequency accomplishments and contacts made within a single day, week, month, or year.

Note: Members of the NWIRA monitor 29.600 MHz, as well as the area repeater on 29.640 MHz (an 1800-Hz tone or whistle is required to access).

Do not send QSL cards! Forward your list of contacts showing the date, time, and frequency of each QSO and provide a brief station description, along with the fee of $4.00 for each award to: Ten-Meter FM Awards Program, 2665 North Busby Road, Oak Harbor WA 98277.

### Worked All Districts Award

To qualify, applicants must work one ten-meter FM station in each of the ten US call districts.

### Worked All States Award

Applicants must work a minimum of fifty US states on ten-meter FM.

### Centurion Award

This award requires the applicant to work a minimum of 100 stations on ten-meter FM.

### DX Decade Award

Applicants must work a minimum of ten DX stations outside the fifty US states and Canada on ten-meter FM.

### North American Award

To qualify, applicants must work all ten US call districts, a minimum of six Canadian provinces and/or territories, and at least four DX countries within the North American continent (other than the US and Canada) on ten-meter FM.

## OPERATING ACHIEVEMENT AWARDS FROM *A5 MAGAZINE*

### Fast-Scan ATV Award

"Getting the amateur television station operating is an award in itself!" This award certificate recognizes the "first" amateur television two-way contact. Endorsements for DX mileage and color ATV are available. Contacts via ATV repeaters are allowed. Award inscriptions are made around the border of the *A5* block. Black and white, 8" × 10".

### Master Scanner *A5* SSTV Award

This award certificate recognizes the serious SSTVer. Entry level is 100 two-way SSTV contacts. Endorsements for 500, 1000, 1500, 2000, etc., are available. Special endorsement for color SSTV is available with verified print copy. A must for every SSTVer! Gold, 8" × 10".

### Specialized Communications Achievement Award

This award recognizes accomplishments in ATV, MSTV, NBTV, SSTV, fax, RTTY, EME, microwaves, and satellites. Entry levels are contacts over 100 miles on ATV. Special-event ATV projects, 25 DX country contacts on SSTV, reception of HF MSTV or fax signals via amateurs, microwave DX, 10 DX foreign countries via EME, 10 two-way contacts on an amateur satellite, and 25 DX countries on RTTY are required, with special endorsements available for additional contacts. Certificates are numbered as received; They are gold, 8" × 10", and suitable for framing.

### Worked All States SSTV

Work all 50 states (including Hawaii and Alaska) with exchange of callsign and signal report in video. A special WAS map is available to color in the states as you get them. This is an ongoing award not limited to the annual contest. Special endorsements are available for multiband WAS.

### Worked All States RTTY

Work all 50 states (including Hawaii and Alaska) with log copy verification. This is an ongoing award not limited to the annual contest. Special endorsements are available for multiband WAS.

### Good Image Award

Awarded at the Dayton Hamvention each year, the Good Image Award is presented to the individual or group of individuals who contributed to the advancement of the *A5* code of communication by technical achievement or public awareness. Top-of-the-line award!

All *A5 Magazine* awards require subscription-label information date codes. Enclose $1.00 for the cost of the award certificate and 50 cents postage for return mailing (envelope is provided). Allow 2–3 weeks for verification and mailing. Send all requests to Awards Manager, *A5 Magazine*, PO Box H, Lowden IA 52255-0408. Winners of awards will be published on a regular basis in *A5 Magazine*.

## CENTRAL STATES VHF SOCIETY OPERATING AWARDS

At the 1981 Central States VHF Conference in Sioux Falls, South Dakota, in August, the Central States VHF Society formally announced its new operating awards program with three colorful awards for VHF/UHF/SHF bands.

Each award was designed to stimulate activity on the bands above 144 MHz. The differences in the awards as well as the variety of endorsements available provide challenging but achievable goals regardless of the station's geographic location or capabilities.

The awards are open to all amateurs—not just CSVHF Society members. To receive rules and application sheets, send a legal-size SASE (with two stamps) to Bob Taylor WB5LBT, 10715 Waverland, Baton Rouge LA 70815.

### General Rules—All Awards

The awards described below are available to all amateurs worldwide who submit details of the required contacts (on the separate award application detail sheet) and have the accuracy of the application certified by a local member in good standing of the CSVHF Society. In addition to the basic awards, certain optional endorsements are available as described below and on the application cover sheet.

For all awards, direct two-way communication must be established on amateur-radio bands of 144 MHz and above. Minimum contact requirements are the exchange of callsigns and signal reports (or other mutually understood information) and receipt of acknowledgement that both stations have received this information. All contacts for each award must be on the same band.

Contacts must be made from the same location or from other location(s) licensed to the application, no two of which are more than 50 miles apart.

Contacts for the VUCC and WHG awards may be made over any period of years, with no starting date, but numbered certificates will be issued only to those who have made the required contacts after August 1, 1981. 1K Coverage Award contacts must be made during any two consecutive months after August 1, 1981.

Contacts made through "repeater" devices or any other power-relay method do not count toward any of the awards. In addition, no crossband contacts are permitted.

False statements on the application cover sheet or on the detail sheet(s) shall result in immediate disqualification for any of the awards.

Remember, you do not have to be a member of the CSVHF Society to apply for an award. However, if you wish to join, send the $5.00 membership dues to: Ted Mathewson W4FJ, CSVHF Society Secretary, 1525 Sunset Lane, Richmond VA 23221. Please do not send dues with awards applications.

### VUCC

The VUCC (VHF/UHF Century Club) award simply requires contacts with 100 different amateur stations. Optional endorsements for working additional stations in increments of 25 (e.g., 125, 150, 175, etc.) or for making all the contacts during a single calendar year (Jan. 1 through Dec. 31) are available only if all the contacts were made on the same mode of propagation (sporadic E skip, EME, meteor scatter, or aurora).

### 1KCA

The 1K Coverage Award requires contacts of sufficient number and distance such that the sum of the QSO points for all the contacts during each of any two consecutive calendar months is equal to or greater than 1000. The QSO points for any given contact are the band points multiplied by the distance points. The band points are determined as follows: 144 = 2, 220 = 5, 432 = 4, 1295 = 5, 2300 = 10, 3300 = 15, 5650 = 25, and 10 GHz and up = 50. The distance points are simply the number of 1-degree-by-1-degree "grids" (see definition under WHG Award) you are away from the other station's 1-degree-by-1-degree grid. For example, if the station is in the next grid over from yours, the distance point for the contact is 1; if it is two grids over, the distance points are 2, etc. Contacts in your own grid have a distance point value of 1. For stations which are not in a grid directly north, south, east, or west of yours (i.e., off at an angle), the distance points have to be calculated. In such cases, the distance points are equal to the square root of the sum of the latitude difference squared and the longitude difference squared, where the differences in latitude and longitude are measured in numbers of whole 1-degree-by-1-degree grids. The resulting distance points are to be rounded off to the nearest tenth. Only one contact with a given station per GMT day counts toward this award, and EME contacts do not count. There are no additional endorsements available for this award.

### WHG

The WHG (Worked Hundred Grids) award requires contacts with stations in 100 different 1-degree-by-1-degree geographic grids. The grids are defined as the area bounded by integral values of latitude and longitude. For example, a station whose longitude is 112 degrees 32 minutes 15 seconds west and latitude is 37 degrees 25 minutes 16 seconds north would be in the grid 112W37N. All stations are urged to include their latitude and longitude and/or equivalent recognized QTH locator code on their station cards to assist others in determining their grid. If you have to determine the other station's grid yourself, it can be done easily by looking up the town location in any good road atlas and then locating the position on a larger map which shows the 1-degree lines of latitude and longitude. Two such maps are listed here:

1. "Map 2-A" comes in two halves (54" × 80" assembled) and is available for $3.00 postpaid from: Branch of Distribution, US Geological Survey, Federal Center, Denver CO 80225. Shown are counties, county seats, capitals, and cities larger than 500,000.

2. Rand McNally's "Contemporary United States" measures 36" × 54" and is available through bookstores for $2.95. The map does not show counties but does include major highways, a number of cities and towns, and 3 degrees more latitude in Canada than the USGS map.

Optional endorsements are available for working additional 1-degree-by-1-degree grids in increments of 25 (e.g., 125, 150, 175, etc.) or for working all the different grids in a single calendar year.

## MARCO POLO

We are proud to announce that the Catanzaro, Italy, chapter of ARI, Associazione Radioamatori Italiani, issues an international DX award called Marco Polo, in order to commemorate the long and difficult travels of this Italian explorer throughout Asia, starting from Venice in the XIII century.

This award is available to any OM/SWL who is a member of the IARU section of his own country and exemplifies the ham spirit through a reenactment of the trail of Marco Polo over the airwaves, by establishing contacts with the various areas mentioned or crossed by the famous Venetian.

A brief summary of the rules is listed below. The cost is $4.00 plus $1.00 for mail coverage; endorsements cost $1.00. For a complete copy of the rules or any inquiries, contact Award Manager I8QLI, Gianni Verdegiglio, PO Box 19, 88100 Catanzaro, Italy.

We think that a large number of DX hunters will be interested in qualifying for this diploma. This award requires skill, diligence, and unrelenting effort in pursuing by radio the ancient trail of Marco Polo. Here's hoping that this award will enhance your pleasure for DX.

### Summary of the Rules

1. This award is available to any OM/SWL member of an IARU chapter.

2. The contacts must be established with countries described by the Venetian explorer Marco Polo in his book, *Il Milione* (*The Million*)—see box, following page.

3. All modes are valid, except crossband.

4. Only one QSO will be considered for each country; the operations must be valid for DXCC, in accord with the rules of ARRL.

5. Various scores are attributed to differ-

## LIST OF COUNTRIES—MARCO POLO AWARD

| Areas or Countries | Prefixes | Points |
|---|---|---|
| Central Greece | SV4 | 4 |
| Israel | 4X, 4Z | 1 |
| Syria | YK | 4 |
| Iraq | YI | 4 |
| Iran | EP | 4 |
| Turkey | TA | 3 |
| Armenia | UG6 | 3 |
| Azerbajian | UD6 | 1 |
| Georgia | UF6 | 1 |
| Turkoman | UH8 | 2 |
| Uzbekh | UI8 | 2 |
| Tadzhik | UJ8 | 2 |
| Kirghiz | UM8 | 3 |
| Alma Ata | UL7G | 3 |
| Mongolia | JT | 7 |
| China | BY | 15 |
| Taiwan | BV | 10 |
| Djibouti | J2 | 2 |
| Masai | 5H3 or 5Z4 | 3 |
| Madagascar | 5R | 8 |
| Kuangtung | CR9 or VS6 | 6 |
| South Korea | HL | 2 |
| Japan | JA | 1 |
| Malaya | 9M2 or 9V1 | 5 |
| Bay of Bengal | XZ or S2 | 10 |
| Siam Gulf | HS or XU | 5 |
| Tibet and Hymalaya | 9N or A51 | 10 |
| India (less Gujarat) | VU | 2 |
| Gujarat (West India) | VU | 8 |
| Sri Lanka | 4S7 | 2 |
| Sumatra | YB4, 5, 6 | 2 |
| Borneo | YB7 or VS5 or 9M6, 8 | 6 |
| Java | YB0, 1, 2, 3 | 2 |
| Yemen area | 4W or 7O | 8 |
| Oman | A4X | 3 |
| Persian Gulf | A6, A7, A9, 9K or HZ | 4 |
| Ethiopia | ET | 10 |
| Somalia | T5, 6O | 7 |
| Zanzibar, Pemba | 5H1 | 7 |

ent countries, in order to remark the skill or the interest: countries referred to same geographical area are scored only once (see list).

6. Contacts are valid starting from January 1, 1978.

7. The award is issued in five classes: 1. Base award, at least 60 points—3-color diploma; 2. Silver award, at least 80 points—3-color diploma, shield; 3. Gold award, at least 95 points—3-color diploma, shield; 4. Honor Roll, at least 110 points—3-color diploma, medal; and 5. Top Honor Roll, at least 125 points—3-color diploma, medal. Endorsements are available each year for class enhancement.

8. QSO listed with band, mode, date, and GMT and signed by at least two hams that are members of DXCC or WAZ must be sent to Award Manager I8QLI, Gianni Verdegiglio, PO Box 19, 88100 Catanzaro, Italy. QSL front/back photocopies are accepted in substitution of signatures; however a list must be provided.

9. The cost of each class of diploma is $5.00 ($4.00 plus $1.00 for mail coverage). Any endorsement must be accompanied by a new general list, number of diploma, and $1.00 plus SAE.

10. The award manager may request original material or photocopies to confirm validity.

11. Alterations, false declarations, or other irregular operations will be considered cause for disqualification.

12. Inquiries should be addressed to ARI, Council of Chapter, Box 200, 88100 Catanzaro, Italy. No other judgment will be considered.

## ONTARIO BICENTENNIAL AWARD

Sponsored by the Radio Society of Ontario, Inc. Contacts valid only for January 1 to December 31, 1984.

**VE3 Stations**

Contact 200 different VE3 or portable VE3 stations. One point each.

**Other VE, VO, VY**

Stations contact 100 different VE3 or portable VE3 stations. Two points each.

**DX Stations Including USA**

Contact 20 different VE3 or portable VE3 stations. Ten points each.

Any mode or band endorsed at your wish. Special seals for each 200 extra points. If VE3 stations are using special call or prefix, they count double. No QSL cards necessary. Send certified log data and $1.00 or 3 IRCs to: VE3LSS, Bicentennial Project, Listowel District Secondary School, Geography Department, Listowel, Ontario, Canada N4W 2M4.

**1984 Special-Event Stations**

VE3SAS—St. Catharines, Ontario, Canada, bicentennial station. QSL via Dave Digweed VE3FOI, 12 Frederick Street, St. Catharines, Ontario, L2S 2S2.

VE3VM—August 4, 5, and 6, special operation from Burgyon Woods, St. Catharines, Ontario, by members of Niagara Peninsula ARC. QSL to PO Box 692, St. Catharines, Ontario, L2R 6Y3.

USA amateurs can use US stamps on SASE, mail will be sent from Niagara Falls NY USA; this is for special-event stations only.

## ARMED FORCES DAY 1984 "MEETING THE CHALLENGE"

This year's observance of Armed Forces Day, set for Saturday, May 19, marks the 35th anniversary of communications tests between amateur-radio operators and military communications systems. Since 1950, this event has been scheduled during the month of May and has emphasized a continuing climate of mutual assistance and warm esteem.

Featured highlights of the nationwide celebration are the traditional military-to-amateur crossband communication test and a message-receiving test. The crossband test will include operations in continuous wave (CW), single sideband voice (SSB), radioteletype (RTTY), and slow-scan television (SSTV). The receiving test consists of two special Armed Forces Day messages from the Secretary of Defense, one transmitted using the CW mode followed by the second transmitted in the RTTY mode.

These tests give both amateur-radio operators and shortwave listeners (SWLs) the opportunity to demonstrate their individual technical skills. Special commemorative acknowledgement (QSL) cards will be awarded to those amateur-radio operators achieving a verified two-way radio contact with any of the participating military radio stations. Interception of these contacts by SWLs is not acknowledged by QSL cards, however, anyone who receives and accurately copies the Armed Forces Day CW and/or RTTY message from the Secretary of Defense can qualify to receive a special commemorative certificate from the Secretary.

| Station | Military Frequency | Emission | Amateur Band |
|---|---|---|---|
| AIR | 4025 kHz | LSB | 3800–4000 kHz |
| 2045th | 6995.5 kHz | CW | 7025–7150 kHz |
| Communication Group | 7306.5 kHz | RTTY | 7080–7100 kHz |
| Andrews Air Force Base | 7315 kHz | LSB | 7225–7300 kHz |
| Washington DC | 13986.5 kHz | RTTY | 14080–14100 kHz |
| | 13997.5 kHz | CW | 14000–14150 kHz |
| | 14408 kHz | USB | 14150–14350 kHz |
| NAM | 14400 kHz | (see operating schedule below) | |
| Naval Communication Area Master Station LANT Norfolk VA | | | |

**14400 Operating Schedule**

| Emission | Time | Amateur Band |
|---|---|---|
| CW | 1300–1700 | 14000–14150 kHz |
| RTTY | 1700–2200 | 14080–14100 kHz |
| USB | 2200–0245 | 14150–14350 kHz |

| Station | Military Frequency | Emission | Amateur Band |
|---|---|---|---|
| NAV | 7372.5 kHz | RTTY | 7080–7100 kHz |
| HQ Navy-Marine Corps MARS Radio Station Cheltenham MD | 14389.5 kHz | SSTV | 14225–14235 kHz |
| NMH | 4015 kHz | CW | 3500–3750 kHz |
| Coast Guard Radio Station | 7346.5 kHz | LSB | 7225–7300 kHz |
| Alexandria VA | 14440 kHz | RTTY | 14080–14100 kHz |
| | 20937.5 kHz | USB | 21250–21450 kHz |
| NMN | 7393 kHz | CW | 7025–7150 kHz |
| Coast Guard Communication Station Portsmouth VA | | | |
| NPG | 4001.5 kHz | LSB | 3800–4000 kHz |
| Naval Communication | 4010 kHz | CW | 3500–3750 kHz |
| Station | 6970 kHz | CW | 3500–3750 kHz |
| Stockton CA | 7301.5 kHz | LSB | 7225–7300 kHz |
| | 7365 kHz | CW | 7025–7300 kHz |
| | 9991.5 kHz | CW | 10100–10150 kHz* |
| | 13927.5 kHz | RTTY | 14080–14100 kHz |
| | 13975.5 kHz | CW | 14000–14150 kHz |
| | 14385 kHz | USB | 14150–14350 kHz |
| | 20998.5 kHz | CW | 21025–21250 kHz |
| *Except 10109–10115 kHz | 21460 kHz | USB | 21250–21450 kHz |
| NPL | 7380 kHz | RTTY | 7080–7100 kHz |
| Naval Communication Station San Diego CA | 14375 kHz | SSTV | 14225–14235 kHz |
| NZJ | 7375 kHz | RTTY | 7080–7100 kHz |
| Marine Corps Air Station El Toro CA | 14480 kHz | USB | 14150–14350 kHz |
| WAR | 4028.5 kHz | LSB | 3800–4000 kHz |
| HQ Army MARS | 6997.5 kHz | CW | 7025–7150 kHz |
| Radio Station | 13992.5 kHz | USB | 14150–14350 kHz |
| Fort Meade MD | 14403.5 kHz | (see operating schedule below) | |
| | 20995.5 kHz | USB | 21250–21450 kHz |

**14403.5 Operating Scehdule**

| Emission | Time | Amateur Band |
|---|---|---|
| RTTY | 1300–1500, 1800–2200, 0100–0245 | 14080–14100 kHz |
| CW | 1500–1800, 2200–0100 | 14000–14150 kHz |

*Table 1.*

**Crossband Contacts**

The military-to-amateur crossband operations will be conducted from 19/1300 UTC to 20/0245 UTC, May, 1984. East-coast stations commence operations at 19/1300 UTC and west-coast stations commence operations at 19/1600 UTC, May, 1984. Military stations will transmit on selected military frequencies and listen for amateur-radio stations on those portions of the amateur bands as indicated in Table 1. The military operator will announce the specific amateur-band fre-

quency being monitored. Duration of these contacts should be limited to three minutes.

**CW Receiving Test**

The CW receiving test will be conducted at 25 words per minute. The broadcast will be a special Armed Forces Day message from the Secretary of Defense to any amateur-radio operator or shortwave listener desiring to participate. A 10-minute call for tuning purposes will begin at 20/0300 UTC, May, 1984. The Secretary's message will be transmitted at 20/0310 UTC, May, 1984 from the stations on the frequencies listed in Table 2.

**Radioteletypewriter Receiving Test**

The radioteletypewriter receiving test will be transmitted at 60 words per minute using 170 Hertz (narrow) shift. A 10-minute call for tuning purposes will begin at 20/0335 UTC, May, 1984. The special Armed Forces Day message from the Secretary of Defense will be transmitted at 20/0345 UTC, May, 1984. Transmission will be from the same stations on the same frequencies as previously listed for the CW receiving test.

**Submission of Test Entries**

Transcriptions of the CW and/or RTTY receiving tests should be submitted "as received." No attempt should be made to correct possible transmission errors. The time, frequency, and callsign of the military station copied as well as the name, callsign, and address (including zip code) of the individual submitting the entry must be indicated on the page containing the test message. Each year, a large number of acceptable entries are received with insufficient information or the necessary information is attached to the transcription and is separated, thereby precluding the issuance of a certificate. Entries must be postmarked no later than May 26, 1984, and submitted to the respective military commands as follows:

Stations copying AIR send entries to: Armed Forces Day Test, 2045CG/DONJM, Andrews AFB DC 20331.

Stations copying NAM, NAV, or NPG send entries to: Armed Forces Day Test, HQ Navy-Marine Corps MARS, 4401 Massachusetts Ave. NW, Washington DC 20390.

Stations copying WAR send entries to: Armed Forces Day Test, Commander, 7th Signal Command, ATTN: CCN-PO-OX, Fort Ritchie MD 21719.

| Transmitting Station | Frequency (kHz) |
|---|---|
| AIR<br>2045th Communication Group<br>Andrews Air Force Base<br>Washington DC | 6995.5, 13997.5 |
| NAM<br>Naval Communication Area Master Station LANT<br>Norfolk VA | 4005, 7393, 14400 |
| NAV<br>HQ Navy-Marine Corps MARS Station<br>Cheltenham MD | 7372.5, 14389.5 |
| NPG<br>Naval Communication Station<br>Stockton CA | 4010, 7365, 13927.5 |
| WAR<br>US Army MARS Radio Station<br>Fort Meade MD | 4028.5, 6997.5, 14403.5 |

*Table 2.*

## GLOUCESTER COUNTY NJ

The Gloucester County Amateur Radio Club will operate W2MMD from 1700Z May 4 to 1700Z May 5, to commemorate the club's 25th anniversary. Phone operation in lower portion of General-class bands 10–80, and CW in Novice bands. Commemorative certificate by QSL to GCARC, PO Box 370, Pitman NJ 08071.

## SUN DAY

The Florida Solar Energy Center (FSEC) of the State University System of Florida and the Indian River Amateur Radio Club will celebrate Sun Day on May 5 and 6, 1500Z to 2200Z. 5,880 photovoltaic 4-inch-diameter solar cells will provide for heating, cooling, cooking, and amateur-radio operations during this public event, Sun Day.

W4NLX/4 will operate on SSB—7.240, 14.240, 21.370, and 28.518; CW—7.040, 14.040, 21.040, and 28.003; and FM—146.28/.88. A beacon will be on 1296.05 MHz.

For all shortwave listeners and amateur-radio operators, *The Solar Collector*, a quarterly high-technology newsletter, is available free, on request. Also, a multicolor certificate is available. Send a business-size SASE to: FSEC, 300 State Road 401, Cape Canaveral FL 32920.

## BALLOON RACE

The Alamance Amateur Radio Club (K4EG) will be operating a special-event station, May 12 and 13, from the site of the Regional Hot Air Balloon Race, Burlington, North Carolina. Each day's operation will be from 1100 to 2200 UTC. Frequencies of operation will be 10 kHz inside the lower General phone portion of 40 and 15 meters, and 7.125 kHz and 21.130 kHz in the Novice bands. An attractive commemorative QSL will be issued to all stations worked for a QSL and an SASE. QSL to: Alamance Amateur Radio Club K4EG, PO Box 3064, Burlington NC 27215.

## DOGWOOD FESTIVAL

Fairfield, Connecticut: The Greater Fairfield ARA will operate WB1CQO from 1300 to 2200 UTC, May 12, during the annual Dogwood Festival. A certificate is available for an SASE. Frequencies: 3.975, 7.235, 14.330, 21.420. Contact: Jerry C. Melson KE1A, Greater Fairfield Amateur Radio Association, PO Box 1364 SM, Fairfield CT 06430.

## ARMED FORCES DAY AT WEST POINT

On May 12 and 13, 1984, The Meadowlands Amateur Radio Association will be operating at the United States Military Academy at West Point, New York, in honor of Armed Forces Day 1984.

The club will be operating under the club station call N2BMN. Operation will be from 1400Z to 2000Z UTC, May 12, and from 1400Z to 1700Z UTC, May 13. Frequencies will be: SSB—14.310, 7.250, 144.225, and 50.125 MHz, FM—146.550 MHz.

Send a large SASE with $.37 US postage to accommodate an 8½" × 11" certificate of confirmation of QSO to: PO Box 324, Little Ferry NJ 07643.

## US AIR FORCE MUSEUM

To celebrate the observance of Armed Forces Day, the United States Air Force Museum will, for the second time, host the operation of an amateur-radio special-event station.

To be housed in the Museum's WWII Nissen Hut, participants will operate under the callsign K8DMZ from 1400Z to 2200Z, Saturday, May 19. Amateur-radio operators will work primarily in General-class phone segments of 75, 40, 20, 15, and 10 meters with periodic excursions to the Novice subbands. FM and SSB operation on the 144-, 220-, and 432-MHz bands is also planned. The specific frequencies to be used will depend upon existing band conditions. To commemorate the event, the museum will issue a special certificate for each two-way contact.

The largest and oldest military aviation museum in the world, the Air Force Museum is located six miles northeast of Dayton at historic Wright-Patterson Air Force Base.

## BIG RED ONE

On May 19 and 20, 1984, Armed Forces Day Weekend, the Wheaton Community Radio Amateurs, Inc., will conduct a special event from the First Infantry Division Museum, Cantigny, in Wheaton, Illinois.

The special-event call will be N9BRO. The 24-hour-long event will be on all bands, beginning at 1700Z (GMT) May 19, 1984. Frequencies will be 50 kHz up from the bottom of the General phone bands, 25 kHz up from the bottom of the General CW bands, and 25 kHz up from the bottom of the Novice bands. RTTY on 146.70 simplex, 14.087, and 21.087. 2 meters on 147.54 simplex. Certificate via WCRA, PO Box QSL, Wheaton IL 60189. $1 or 5 IRCs.

## ARMED FORCES DAY

In recognition of the 35th annual Armed Forces Day celebration, amateur-radio station W4ODR, located aboard Naval Air Station Memphis, Millington, Tennessee, will be operating on Saturday, May 19, from 1400Z to 2200Z. Plans call for operation on 7.230 (± 10 kHz). CW frequency will be 21.145. 146.52 will be the 2m frequency. It is hoped that operation will be continuous on all bands, but check all frequencies to be sure. Special certificates and QSL cards will be available to those who work W4ODR. QSL to amateur-radio station W4ODR, PO Box 54278, Millington TN 38054. A brief description of the Navy Memphis complex follows.

The 3,400-acre Navy Memphis complex is located 13 miles north of Memphis, Tennessee, and five miles east of the Mississippi River. NAS Memphis is the home of the Chief of Naval Technical Training (CNTECHTRA) and the Naval Air Technical Training Center (NATTC).

CNTECHTRA administers the technical training program for the entire US Navy. Training conducted under the auspices of CNTECHTRA begins with the basic training for all Navy recruits and officer candidates. It continues through various levels of technical skills training and includes instruction for the highly advanced technicians who maintain and operate the extremely technical and sensitive devices found on the Navy's aircraft, ships, and submarines.

Over 3,000 Navy courses of instruction are conducted throughout the command's network of 58 schoolhouses, located at 27 different installations, stretching from the east coast to the west coast, the Great Lakes to the Gulf of Mexico, and across the Pacific to Hawaii. The coordination, supervision, planning research, and guidance for these courses take place at the Millington-based headquarters.

NATTC is the largest single command in the Navy Memphis complex with over 40 different courses of instruction. It stands some 10,000 strong, including students, instructors, and support personnel. The training center's mission is to train selected Navy and Marine aviation personnel in aeronautical technical phases of naval aviation and other related subjects as directed by the Chief of Naval Operations.

## PORTSMOUTH SEAWALL FESTIVAL

Portsmouth, Virginia: The Portsmouth ARC will operate W4POX at the Portsmouth Seawall Festival at Portside, May 26, 27, and 28, 1500–2200Z. Frequencies will be around 7230 and 14.290 MHz. For special commemorative QSL, send your card and SASE to: W4POX, PO Box 6503, Portsmouth VA 23703. For QSL and a large commemorative certificate, send your card and a 9" × 12" envelope with two units of first-class postage.

## WINO WEEKEND

The Wireless Institute of Northern Ohio (WINO), an organization sponsored by the Lake County Amateur Radio Association, will be on the air with a special-event station to commemorate Ohio Wine Week on Saturday, June 2, and again on Sunday, June 3. On Saturday evening we will be operating between 7 and 11 pm EDST (2300Z June 2 to 0300Z June 3) on 3910 MHz and 7235 MHz. On Sunday afternoon we will be on between 11 am and 4 pm EDST (1500Z to 2000Z) on 7235 MHz and 21360 MHz. The station will be located at an actual winery in Madison, Ohio, and will use the call KO8O. A special 8½" by 11" QSL certificate will be available from: KO8O—WINO Weekend, 7126 Andover Drive, Mentor OH 44060, for a legal-sized SASE.

## FAR SCHOLARSHIPS

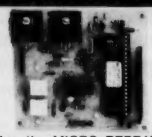
The Foundation for Amateur Radio, Inc., a nonprofit organization with headquarters in Washington DC, plans to award 15 scholarships for the academic year 1984–85. The foundation, composed of fifty local-area amateur-radio clubs, fully funds two of these scholarships from the proceeds of its annual hamfest. It administers, without cost to the donors, three scholarships for the Quarter Century Wireless Association, two for the Dade (FL) Radio Club and one each for the Radio Club of America, the Richard G. Chichester Memorial, the Young Ladies' Radio League, the Edmund B. Redington Memorial, the Amateur Radio News Service, the Columbia (MD) Amateur Radio Association, the Baltimore (MD) Amateur Radio Club, and the Lewis G. Wilkinson Memorial.

Licensed radio amateurs may compete for one or more of these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college, or technical school. Most of the scholarships require the applicant to hold at least an FCC General-class license or equivalent. The scholarship awards range from $350 to $900 with preference given in some cases to residents of specified geographical areas or the pursuit of certain study programs.

Additional information and an application form can be requested by a letter or QSL/postcard, postmarked prior to May 31, 1984, from: FAR Scholarships, 6903 Rhode Island Avenue, College Park MD 20740.

The foundation is devoted exclusively to promoting the interests of amateur radio and to those scientific, literary, and educational pursuits that advance the purposes of the Amateur Radio Service.

## MICROCOMPUTER REPEATER CONTROL



as featured in

QST December 1983

Introducing the MICRO REPEATER CONTROLLER, a NEW CONCEPT in low cost, easy to interface, micro computer repeater control. State of the art control features HIGH RELIABILITY, LOW POWER, SMALL SIZE. Reconfigurable COR and PTT interface included. Optional USER MODULE allows control personality to be easily changed. INTERFACE GUIDE included.

- *TWO CW ID MESSAGES
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- *HANG TIMER
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- *HIGH CURRENT PTT INTERFACE
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- *SIZE 3.2" × 3.2"

RPT-1 A KIT .....$115 plus $2.50 shipping

**16 DIGIT TOUCH TONE DECODER**

CRYSTAL CONTROLLED TOUCH TONE decoder requires NO TUNING. Drift free. Decodes all 16 digits. DIAL TONE and NOISE REJECTION FILTERS. EXCELLENT NOISE AND SPEECH IMMUNITY. HIGH SENSITIVITY. HIGH RELIABILITY. LOW POWER 12 VOLT. Size 2.3" × 3".
TTD-1A KIT $79.95 plus $2.00 shipping.

**LOW COST COMMAND DECODER**

Remote control for a repeater, link, remote base. Controls 4 on/off functions or 2 on/off, 2 momentary. Expandable to 16 functions. User selectable 1 or 2 digit security access code + on/off digit. NO TUNING. EASY TO INTERFACE. Use with TTD-1A. Low power 12 volt. Size 3" × 3.2".
LCD-1A KIT $39.95 plus $2.50 shipping.

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170

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NEW!

- SUPER 80-POUND, 100-MPH GRAY MAGNETIC MOUNT WITH MYLAR BASE
- 5/8 WAVE FOR PHASE II SIGNAL * AND *
- 1/4 WAVE FOR CLOSE-IN AND RESTRICTED HEIGHT AREAS
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- SUPERIOR PERFORMANCE
- STAINLESS STEEL SPRING AND WHIP
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- BOTH ANTENNAS ARE FREQUENCY ADJUSTABLE
- COMPLETE WITH 17 FEET OF FOAM COAX AND PL-259 CONNECTOR
- MADE IN U.S.A.

INTRODUCTORY PRICE:

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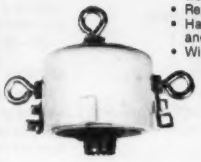
- For dipoles, yagis, inverted vees and doublets
- Replaces center insulator
- Puts power in antenna
- Broadbanded 3-40 MHz.
- Small, lightweight and weatherproof
- 1:1 Impedance ratio
- For full legal power and more
- Helps eliminate TV!
- With SO 239 connector
- Built-in DC ground helps protect against lightning

**Only $14.95**

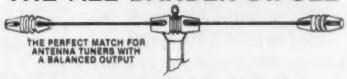
## HI-Q ANTENNA CENTER INSULATOR



- Small, rugged, lightweight, weatherproof
- Replaces center insulator
- Handles full legal power and more
- With SO 239 connector

**$6.95**

## THE ALL-BANDER DIPOLE




- Completely factory assembled ready to use
- Heavy 14 (7/22) gauge stranded copper antenna wire to survive those severe storms
- Center fed with 100 feet of low loss PVC covered 450 ohm balanced transmission line
- Includes center insulator with an eye hook for center support
- Includes custom molded insulators molded of top quality material with high dielectric qualities and excellent weatherability
- Complete installation instructions included
- Overall length 135 feet, less when erected as an inverted vee or sloper
- Handles 2 kw PEP & covers 160 through 10 meters
- May be trimmed to fit small city lots

**Only $29.95**

## DIPOLES

| MODEL | BANDS | LENGTH | PRICE |
|---|---|---|---|
| **Dipoles** | | | |
| D-80 | 80/75 | 130' | $31.95 |
| D-40 | 40/15 | 66' | 28.95 |
| D-20 | 20 | 33' | 27.95 |
| D-15 | 15 | 22' | 26.95 |
| D-10 | 10 | 16' | 25.95 |
| **Shortened dipoles** | | | |
| SD-80 | 80/75 | 90' | 35.95 |
| SD-40 | 40 | 45' | 33.95 |
| **Parallel dipoles** | | | |
| PD-8010 | 80,40,20,10/15 | 130' | 43.95 |
| PD-4010 | 40,20,10/15 | 66' | 37.95 |
| PD-8040 | 80,40/15 | 130' | 39.95 |
| PD-4020 | 40,20/15 | 66' | 33.95 |
| **Dipole shorteners — only, same as included in SD models** | | | |
| S-80 | 80/75 | | $13.95/pr. |
| S-40 | 40 | | 12.95/pr. |

All antennas are complete with a HI-Q Balun, No. 14 antenna wire, insulators, 100' nylon antenna support rope (SD models only 50'), rated for full legal power. Antennas may be used as an inverted V, and may also be used by MARS or SWLs.

**Antenna accessories** — available with antenna orders

| | |
|---|---|
| Nylon guy rope, 450 lb. test, 100 feet | $4.49 |
| Molded Dogbone Type antenna insulators | 1.00/pr. |
| SO-239 coax connectors | .55 |
| No. 14 7/22 Stranded hard drawn copper antenna wire | .08/ft. |

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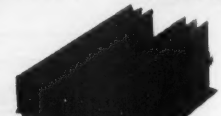
Dealer Inquiries Invited

## CALL LONG DISTANCE ON YOUR HANDHELD

The Model 335A will deliver 35 watts of power using the latest state-of-the-art circuitry. The amplifier will operate SSB or FM and is compatible with most handheld transceivers, including the TR2400, TR2500, IC-2AT, Yaesu, Santec, and Ten-Tec. Only 300 mw input will deliver 5 watts out; 3 watts in will deliver 35 watts out. Maximum input drive level is 5 watts.



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Model 335A
Kit $69.95
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14

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- Complete automatic operation
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**Now Available**—A commercial version of the GMS 401. Designed to charge up to and including the commercial 15 volt Nicad packs. $139.00 plus same shipping and module cost as the GMS 401.

The GMS 401 is a complete automatic NICAD conditioner and rapid charger. Never before has this been offered anywhere at any price and it's so good it's being patented. NICAD memory characteristics must be dealt with otherwise your battery pack is not delivering all it could. The GMS 401 will automatically erase and rapid charge any type NICAD pack from 1 to 10 cells.

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See List of Advertisers on page 114

# CONTESTS

*Robert Baker WB2GFE*
*15 Windsor Dr.*
*Atco NJ 08004*

## LATE SPRING QRP SSB ACTIVITY WEEKEND
### May 5–6

This is one of several QRP activity weekends held throughout 1984 by the G-QRP-Club of England. The events are intended to promote QRP activity at the times and on the frequencies suggested. Members from other QRP clubs throughout the world and all amateurs interested in QRP are invited to join in at the following times and frequencies:

| Times (GMT) | Frequencies |
|---|---|
| 0900–1000 | 14285 |
| 1000–1100 | 21385/28885 |
| 1100–1200 | 7090 |
| 1200–1300 | 3690 |
| 1300–1400 | 14285 |
| 1400–1500 | 3690 |
| 1500–1730 | 21385/28885 |
| 1730–2000 | 14285 |
| 2000–2100 | 7090 |
| 2100–2200 | 3560 |
| 2200–2300 | 14285 |

Remember this is an SSB activity and many of the suggested frequencies are outside the USA bands.

## FLORIDA QSO PARTY
### 1400 to 1900 GMT May 5
### 0001 to 0500 GMT May 6
### 1500 to 2300 GMT May 6

This is the 18th annual Florida QSO Party sponsored by *Florida Skip*. All amateurs worldwide are eligible and invited to participate. All amateur bands may be used, 160 through 2 meters. All stations will separate phone and CW logs; phone and CW are separate contests. A station may be worked once on each band on each mode. Neither crossband nor crossmode contacts will count for contest credit. Florida stations may work other Florida stations, but for contest points only. Out-of-state stations may not work each other for contest credit. Contacts made on repeaters do not count for credit.

Florida stations will be divided into two classes. Class-A stations are those operating portable or mobile on emergency power and running 100 Watts or less output inside Florida but outside of their home counties. Class-B stations are all other stations operating in Florida. Entrants may be single-operator or multi-operator and this must be indicated on the summary sheet.

Each entrant agrees to be bound by the provisions of the contest announcement, the regulations of the applicable licensing authority, and the decisions of the *Florida Skip* Contest Committee, which are final.

*EXCHANGE:*

Florida stations send RS(T) and county of operation. Others send RS(T) and US state, Canadian province, or country.

*FREQUENCIES:*

Phone—3945, 7279, 14279, 21379, 28579, 50.2, 146.52.

CW—3555, 7055, 14055, 21055, 28055.

*SCORING:*

Florida stations count one point per QSO with out-of-state or other Florida stations. Multiplier is the sum of states (49 max.), provinces (12 max.), and DX countries (27 max.) actually worked; maximum multiplier is 88. Others count 2 points per QSO with each Florida station. Multiplier is the number of different Florida countries worked (67 max.). Final score is the product of QSO points and the multiplier. Class-A stations *only*, multiply score by 1.5 to obtain final total.

*AWARDS:*

Certificates for phone and CW to the top single-operator score in each state, province, DX country, and Florida county. Multi-operator winners will receive certificates as activity justifies. There are also 5 plaques to be awarded as follows: high single operator in Florida and out of state, CW and phone, and the Florida club with the highest aggregate score. A minimum of 25 contacts must be made to be eligible for a certificate.

*ENTRIES:*

Phone and CW entries are to be *separated!* Along with legible logs in chronological order, a summary sheet is required with each entry. The summary sheet must contain score, number of QSOs, multiplier, station callsign, entry class, number of Florida counties, power source (for Class-A entries), county, state, province, country, or region of operation, callsigns of all operators/loggers if multi-op, name of club if part of a club aggregate score, name and address *typed or printed in block letters*, and a signed declaration that all rules and regulations have been observed. All stations making more than 200 QSOs must also include a dupe sheet. Sample summary and log sheets are available for an SASE from the QTH below.

At the discretion of the contest committee, stations and/or operators may be disqualified for improper reporting, excessive dupes, errors in multiplier lists, unreadable logs, obvious cheating, etc. All entries must be received on or before June 3. Mail all entries to: *Florida Skip* Contest Committee, c/o Florida Amateur Radio Society, PO Box 9673, Jacksonville FL 32208.

## MICHIGAN QSO PARTY
### 1800 GMT May 19 to
### 0300 GMT May 20
### 1100 GMT May 20 to
### 0200 GMT May 21

This year's QSO party will be sponsored by the Oak Park ARC. Phone and CW are combined into one contest. Michigan stations can work Michigan counties for multipliers. A station may be contacted once on each band/mode. Portables/mobiles may be counted as new contacts each time they change counties.

*EXCHANGE:*

RS(T), QSO number, QTH as state, country, or Michigan county.

*FREQUENCIES:*

Phone—1815, 3905, 7280, 14280, 21380, 28580.

CW—1810, 3540, 3725, 7035, 7125, 14035, 21035, 21125, 28035, 28125.

VHF—50.125, 145.025, 146.52.

*SCORING:*

Multipliers are counted only once. Michigan stations score 1 point per phone QSO and multiply by the total number of states, countries, and Michigan counties. Each CW contact counts 2 points; KL7 and KH6 count as states; VE counts as a country. Maximum multiplier is 85.

Others, take QSO points times the total number of Michigan counties. QSO points are 1 point per phone QSO, 2 points per CW QSO, and 5 points for each club-station contact with W8MB. Maximum multiplier is 83.

VHF only entries: same as above except multipliers per VHF band are added together

# RESULTS

## SARTG WORLDWIDE RTTY CONTEST 1983

**Class A—Single Operator**

| | | |
|---|---|---|
| 1. | ON4UN | 567,000 |
| 2. | UT5RP | 307,230 |
| 3. | SM6ASD | 263,885 |
| 4. | DK8NG | 249,165 |
| 5. | HB9HK | 220,950 |

**Class B—Multi-Operator**

| | | |
|---|---|---|
| 1. | OH0TTY | 344,960 |
| 2. | OH2TI | 219,550 |
| 3. | OH2AH | 70,750 |
| 4. | OK3KGI | 44,390 |
| 5. | HA3KHB | 6,555 |

**Class C—SWL**

| | | |
|---|---|---|
| 1. | OZ-DR 2135 | 270,500 |
| 2. | Y2-2814/M | 123,370 |
| 3. | OK1-23185 | 105,560 |
| 4. | NL-4483 | 86,790 |
| 5. | FE-3700 | 68,735 |

**Top Americans**

| | | |
|---|---|---|
| 10. | KA3GIK | 116,250 |
| 12. | W4CQI | 105,600 |
| 13. | KB2VO | 105,525 |
| 19. | K6WZ | 44,490 |
| 20. | WB4VBD | 44,200 |

**Top American SWL**

| | | |
|---|---|---|
| 7. | J. Mathews | 41,850 |

# CALENDAR

| | |
|---|---|
| May 5–6 | Late Spring QRP SSB Activity Weekend |
| May 5–6 | Florida QSO Party |
| May 19–21 | Michigan QSO Party |
| Jun 9–10 | ARRL VHF QSO Party |
| June 23–24 | ARRL Field Day |
| Jul 13–15 | A5 International SSTV DX Contest |
| Aug 4–5 | ARRL UHF Contest |
| Aug 11–12 | New Jersey QSO Party |
| Aug 18–19 | SARTG Worldwide RTTY Contest |
| Aug 24–27 | A5 North American UHF FSTV DX Contest |
| Sep 8–9 | ARRL VHF QSO Party |
| Sep 15–17 | Washington State QSO Party |
| Sep 22–23 | Late Summer QRP CW Activity Weekend |
| Oct 6–7 | ARRL QSO Party—CW |
| Oct 13–14 | ARRL QSO Party—Phone |
| Nov 3–4 | ARRL Sweepstakes—CW |
| Nov 17–18 | ARRL Sweepstakes—Phone |
| Dec 1–2 | ARRL 160-Meter Contest |
| Dec 8–9 | ARRL 10-Meter Contest |
| Dec 26–Jan 1 | QRP Winter Sports—CW |

LAKE COUNTY AMATEUR RADIO ASSOC.
LAKE ERIE
LAKE COUNTY
OHIO
ORGANIZED FOR HOBBY AND SERVICE

## ## THE LCARA PATCH ##
### NEWSLETTER OF THE MONTH

*THE LCARA PATCH* is another fine example of the outstanding newsletters being produced every month by ham organizations around the world. Featuring club news and meeting minutes, excerpts from *The Westlink Report* and the *W5YI Report*, DX and FCC news, and much more, the February issue (for example) contained 40 different articles. Congratulations, Editor Gary Kneisley KC8GN!

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

for total multiplier. No repeater contacts are allowed.

*AWARDS:*

Plaques to Michigan entries with high multi-operator/single-transmitter score, high Michigan score, high Michigan (Upper Peninsula) score, high aggregate club score, high VHF only (100 QSOs minimum), high mobile, and high out of state. Certificates to high score in each county with a minimum of 50 QSOs. Out-of-state certificates for high score in each state and country.

*ENTRIES:*

A log and summary sheet are requested showing the scoring and other pertinent information, name and address in *block letters*, and a signed declaration that all rules and regulations have been observed. Michigan stations include club name for combined club score. Party contacts do not count toward the Michigan Achievement Award unless one fact about Michigan is communicated. Members of the Michigan Week QSO Party Committee are not eligible for individual awards. Decisions of the Contest Committee are final. Results will be final on July 30th and will be mailed to all entries. Mailing deadline is June 30. Entries should be sent to: Mark Shaw K8ED, 3810 Woodman, Troy MI 48084.

## MICHIGAN ACHIEVEMENT AWARD

This will be the 26th year that hams have had their own program to publicize Michigan and its products. Just as for the past years, the governor will award Achievement Certificates to hams who take part in telling the world of Michigan's unlimited resources, opportunities, and advantages. Certificates are awarded on the following bases:

1. A Michigan ham submits log information and names and addresses (if possible) of 15 or more contacts made to out-of-state or DX hams with information regarding Michigan.

2. An out-of-state ham, including Canada, submits log information and names and addresses (if possible) of at least 5 Michigan hams who relate facts to him about Michigan.

3. A foreign ham, excluding any resident of Canada, submits the call letters and name and address plus log information for at least one Michigan ham who has told him about Michigan.

Only QSOs made during Michigan Week, May 19–26, will be considered valid. All applications for certificates must be postmarked by July 1 and mailed to: Governor James Blanchard, Lansing MI 48902.

# FUN!

*John Edwards KI2U*
*PO Box 73*
*Middle Village NY 11379*

## INTO THE ARCHIVES

The other day, while rummaging through the KI2U archives, I came across a facsimile of an ARRL membership application, circa 1914. Did you know that one had to apply for ARRL membership back in the old days? Shows you how standards have dropped. These days, the ARRL even accepts people like me and AF2M.

At any rate, I thought it might be fun to fill in the application and send it back to the League along with my renewal check. Herewith, the ARRL's questions and my responses:

*Your name:* Ah, an easy question. J. J. Edwards.

*Address:* Another easy one. PO Box 73, Middle Village NY 11379. My QTH is a little cramped, but the address has a nice ring to it.

*Your age:* I'm beginning to get touchy about questions like this. Twenty-nine. Really!

*Your station call letters:* KI2U. Hope they don't mind the number.

*Length of your aerial?* Which one? Let's see, the boom on my HF beam is about 13 feet long.

*Do you obtain your power from batteries or city current?* It depends. My HT uses batteries.

*Do you use a spark coil or transformer?* Strange question. Most of my power supplies have transformers, I think.

*What is your approximate receiving range in miles?* Hmmm. I didn't get to hear W5LFL, but I have worked EME. Let's say 500,000 miles, give or take a few hundred thousand.

*Are you troubled by interference?* You bet. My Apple generates a torrent of RFI. Next question.

*Have you telephone connection in your house, or convenient?* In my house, not my convenient.

*Do you keep your station practically constantly in running order?* Yes, my station is practically running.

Here's hoping my answers help make a better ARRL.

## ELEMENT 1
## MULTIPLE CHOICE

1) In a folded dipole:
   1) Current in all conductors are in phase
   2) Current in all conductors are out of phase
   3) Current exists only in the dielectric
   4) Height is rarely important
2) A quarter-wave transformer is:
   1) A quality detector
   2) Also known as a "Q" section
   3) May be used as an inductance transformer
   4) Used only with coaxial feedline
3) A fishbone is a:
   1) Dipole
   2) Traveling-wave antenna
   3) Helical antenna
   4) Type of receiver
4) The antenna used by Marconi to receive the first transatlantic radio signals was held aloft by a:
   1) Balloon
   2) Building
   3) Man
   4) Kite
5) A "capacitance hat" is most often used on:
   1) Cubical quads
   2) Yagis
   3) Dipoles
   4) Whip antennas

## ELEMENT 2
## TRUE-FALSE

| | | True | False |
|---|---|---|---|
| 1) | All Apple IIs come equipped with a Z80 microprocessor. | ____ | ____ |
| 2) | CP/M was the first microcomputer language. | ____ | ____ |
| 3) | That fellow in the IBM Personal Computer ads is supposed to be Charlie Chaplin. | ____ | ____ |
| 4) | The Z80, Z80A, and Z80H microprocessors are all made by Zilog, Inc. | ____ | ____ |
| 5) | The 6502 is made by Intel. | ____ | ____ |
| 6) | The floppy disk was invented by IBM. | ____ | ____ |
| 7) | VisiCalc is an integrated software package. | ____ | ____ |
| 8) | A "mouse" is computer slang for a programming error. | ____ | ____ |
| 9) | The term "byte" is a contraction of the words "binary" and "digit." | ____ | ____ |
| 10) | FORTRAN is a business-oriented language. | ____ | ____ |

## ELEMENT 3
## FILL IN THE BLANK

1) Most solid-state Class C amplifiers are operated with both base and _____ leads connected to ground.
2) S-meter readings are purely _____.
3) "Rushbox" was the name given to a rig with a _____ receiver.
4) Dr. Carl Zener invented the _____.
5) CMOS: complementary-symmetry, metal-oxide _____.

## ELEMENT 4
## SCRAMBLED WORDS

Unscramble these words dealing with packet radio.

| | | |
|---|---|---|
| iantermi | doen | drrehawa |
| erawtosf | verscetrina | loip |
| shandhkea | mearf | glipdaerte |
| coprolto | | |

## THE ANSWERS

*Element 1:*
1—1, 2—2, 3—2, 4—4, 5—4.

*Element 2:*
1—False A 6502. Of course, you can always buy a Z80 co-processor board.
2—False CP/M is an operating system, not a language.
3—False IBM says it's not Charlie, but "Everyman." Could have fooled me.
4—True Eight-bit favorites.
5—False By Motorola. A name that's somewhat familiar to hams.
6—True Who else?
7—False It's just a plain, old, electronic spreadsheet.
8—False It's an input device—like a keyboard or joystick.
9—False But "bit" is.
10—False FORTRAN is a language aimed at scientific applications. COBOL is for business.

*Element 3:*
1—emitter
2—relative
3—superregenerative
4—zener diode
5—silicon

*Element 4:*
terminal, node, hardware; software, transceiver, poll; handshake, frame, digipeater; protocol.

## SCORING

*Element 1:*
Five points for each correct answer.
*Element 2:*
Two and one-half points for each correct answer.
*Element 3:*
Five points for each correct fill-in.
*Element 4:*
Two points for each word correctly unscrambled.

So, how did you do?

1–20 points—Poor
21–40 points—Fair
41–60 points—Good
61–80 points—Better
81–100+ points—Bingo!

# HAM HELP

I am looking for any amateur-radio-related programs for the Timex/Sinclair 1000 computer. I also need a schematic for a Hallicrafters Commander Thirty-Two UHF high-band transceiver.

**Scott Harvey KA7FVV**
**N. 5011 Idaho Rd.**
**Newman Lake WA 99025**

In August, we are spending our third holiday in your wonderful country. As we have done before, we are requesting a couple of nights of hospitality in New York. This is our first visit to the city, but we have made good friends in Washington and LA through this unorthodox method. Hospitality will of course be reciprocated in our home, which is convenient for Scotland and Hadrian's Wall and on a direct route to London.

We are in our late thirties and very easy to get on with. We happen to prefer meeting people informally to staying in impersonal hotels.

Michael is a licensed ham, a computer engineer, and a soaring instructor. I am a final-year student doing social work. We love cats and have no feeding problems or peculiarities. In fact, we are a thoroughly nice couple. All letters will be replied to.

**Pat and Michael Stott**
**"Wellview"**
**12 Caste View**
**Ovingham**
**NE42 6AT**
**England**
**Phone: 0661 32020**

Wanted: manual or any information on a WRC-1 transmitter/receiver.

**Tommy Norris KA4RKT**
**Rte. #1, Box 412**
**Auburn KY 42206**

I hear that the Standard SR-C146-A hand-held can be modified from two to four Watts output via a circuit modification. Anyone having information to this effect, please advise.

**Ted Allen WB3CVN**
**11 Penarth Road**
**Bala-Cynwyd PA 19004**

# W2NSD/1
# NEVER SAY DIE
## editorial by Wayne Green

*from page 6*

have to have some system for getting Novices to keep on moving their code speed up until it reaches at least 35 per. It means making sure that we don't let a few lazy hams reflect badly on all of us by letting their code speed slip just because they spend most of their hamming time rag-chewing on phone or working RTTY. None of us wants to see that happen, right?

One possible way to help all of us keep our code speed up, even if we do spend a good deal of time on phone, might be to require all operators to exchange callsigns only on CW, even for phone contacts. After all, RTTY operators for many years had to send their calls on CW before and after each transmission. We could go further and make it illegal to give your call on voice. I'd like to see someone put that into a petition and send it to the FCC as part of the obviously needed beefing-up of code.

You know, if we don't outlaw repeating the callsign on voice, we could see many ops putting the CW identification on a ROM chip at 100 wpm, operated by the mike button. Could we even outlaw the use of computers to decipher the callsigns sent on CW? Why not?

The more we encourage amateurs to use computers and code keyboards, the more likely we are to have amateurs getting lazy about their code speed. Also, if any of the FEMA or CD crowd get a taste of high-speed digital communications, we're going to have a hard time getting them to let us use Morse code for emergencies. Best we do what we can to discourage RTTY, ASCII, packet radio, and other systems which do not depend entirely on the code skills of licensed amateurs. We sure don't want any unlicensed operators putting us out of work in emergencies—not even after WTCAD.

Computers and keyboards are pernicious things, automating communications and taking it out of the hands of us, er, amateurs. The ARRL has been fighting RTTY for the last thirty years—obviously going along with the main line of amateur convictions.

Okay, what should we do next? I've already proposed a little rule change to the FCC which I feel is necessary if we are going to make sure that none of the old-timer hams lets his code speed slip. Perhaps the next step is to get a bit more spectrum for CW communications. Wouldn't it be great if we could put the 40m band back the way it was 50 years ago? That used to be strictly a CW band in those days. And you didn't hear any foreign broadcast stations there, either. It wasn't until we opened 40m to phone communications that they were able to creep in. Now they've just about squeezed amateurs out of our phone band. If we go back to CW, we might be able to push those bums out. So let's see some proposed 40m changes, eh? Let's get phone out of there—and perhaps RTTY also.

40m used to be the truly great ham band of the world. There used to be more ham activity—and that was 100% good old honest CW, chum—than on any other ham band. It was packed solid with CW ops 50 years ago—and can be again. Ask any old-timer about it.

You know, I think 40m began to go downhill a bit when they invented the vfo. You youngsters don't know the excitement of plugging in a crystal, firing up your rig, calling a long CQ, and then tuning the entire 300 kHz of the band for a call. None of this slam-bam stuff. None of these three-by-three calls. If you wanted to get someone, you called CQ for three to five minutes. And when you were calling someone, you called them for several minutes so they could tune up the band and find you, often checking hundreds of signals as they tuned. Doesn't that sound worlds better than sending a quick CQ and checking your frequency? You bet! Do you think we could bring back crystals and junk all these confounded synthesizers we've been forced to buy?

If they took all that crap out of our rigs, they could get the price down more where it ought to be. I remember when you could buy a nice ham receiver for $29.50—the good old Hallicrafters Sky Buddy. By the time they've put in ten or fifteen bands, synthesis, sideband generators, and demodulators, is it any wonder some of these rigs cost over $500? We don't need all that stuff for CW, so let's get rid of it.

Hey, I'll be looking for you on 40m just as soon as I find where I put my key, okay? It's around here somewhere—I saw it a couple of years ago.


**HAM SOFTWARE for COMMODORE 64 & VIC-20 (w/16K)**

**The Log Book**, a general purpose program for recording, searching for (by call, band, QTH & QSL status), retrieving & (optionally) printing QSOs. ($24.95, postpaid USA)

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**PROGRAM FEATURE:**
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- computer keeps track of time & date*
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- cassette, with album & instruction book

*Featured in the Log Book & Contest Logger only.

**IN DOUBT?** The instruction book is $3.50, which is applicable to the cost of the program. Specify your computer when ordering.

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RG58AU stranded mil spec ..... 12¢/ft.
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RG8X 95% shield ..... $14.95/100 ft. or 17¢/ft.
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RG58U 80% shield ..... 07¢/ft.
RG58U 95% shield ..... 10¢/ft.
RG59U 100% foil shield, TV type ..... 10¢/ft.
RG8U 97% shield 11 ga. (equiv. Belden 8214) ..... 31¢/ft.
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# NEW PRODUCTS

## EXL-5000 DIGITAL COMMUNICATIONS TERMINAL

Amateur-Wholesale Electronics has introduced the revolutionary EXL-5000 digital communications terminal.

The EXL-5000 features a built-in high-resolution long-persistence green monitor for sharp, clear images with no jiggle or jitter even under fluorescent lighting. Also featured are an external plug-in keyboard and a versatile built-in power supply for 117/234 V ac or 13.8 V dc. Operation is by front-panel push-button controls.

The EXL-5000 includes capability for operating in the new AMTOR modes A, B, and L. A high-speed demodulator allows Baudot and ASCII operation from 12 to 600 baud at TTL level, in increments of 0.1 baud. The demodulator will work with high or low tones. For transmitting, AFSK or FSK keying can be used. Morse sending and receiving speed is adjustable from 5 to 100 wpm in 1-wpm steps, with receive auto-tracking and variable transmitting weight.

A 1,280-character display memory is split into two pages of 40 characters by 16 lines. Seven independently-programmable 72-character channels and eight independently-programmable 24-character channels allow storage of messages for permanent use. The memories can be preloaded and reprogrammed. Errors are easily corrected. The programmable memories are backed up by an internal battery so that they are never lost.

Other features of the EXL-5000 include: full control, function display, split-screen operation, automatic send/receive switching, automatic carriage return and line feed, automatic letters-code insertion, word-mode and line-mode operation, word wraparound, simultaneous send-receive capability, selective calling, automatic timer-controlled transmission, RY and "quick-brown-fox" test signals, automatic ID, random-character generator for code practice, a printer interface, provision for an external monitor, a built-in audio monitor, a bar-graph LED tuning meter, noise-reduction receiving circuit, time clock, and much more.

Further information about the EXL-5000 may be obtained from *Amateur-Wholesale Electronics, Inc., 8817 S.W. 129th Terrace, Miami FL 33176; (305)-233-3631.* Reader Service number 479.

## MODEL 510SA SMART PATCH

A new simplex autopatch will work on any amateur or commercial simplex radio and is easy to install. CES engineers have redesigned the VOX-enhancement circuitry and mobile-presence detectors in the Model 510SA Smart Patch. The improvements allow the advanced microcomputer in the Smart Patch to keep the user from missing words or information. The Smart Patch gives the mobile complete and immediate full break-in capability without losing information. The immediate control feature allows operation in the amateur service because Smart Patch cannot transmit on top of another mobile. Transmission can be terminated by an operator simply keying his transmitter. Installation consists of connecting RX audio, TX audio, PTT, and power. For more information about the Smart Patch, contact *Communications Electronics Specialties, Inc., PO Box 2930, Winter Park FL 32790; (800)-327-9956.* Reader Service number 477.

## NEW HT AMPLIFIERS

Mirage Communications has recently announced the addition of two new low-profile HT amplifiers to their expanding line of American-made communications equipment.

The B23A (144–148 MHz) and C22A (220–225 MHz) incorporate features that typically are only available on larger, more expensive amplifiers into a slim-line, low-profile package for HT use. Both amplifiers feature a built-in receive preamp that delivers a 1.5–20-dB noise figure, all-mode operation (CW, FM, or SSB), and automatic antenna changeover.

The rf power input range, from 100 mW to 5 Watts, and high rf power output (B23A, 2 W in/20 W out; C22A, 2 W in/30 W out) make them ideal for use with low-power transmitters.

The B23A and C22A are backed by a 5-year factory warranty (1 year on rf power transistors) and a worldwide sales network.

For more information, contact your nearest dealer or write to Everett L. Gracey, *Mirage Communications, PO Box 1000, Morgan Hill CA 95037; (408)-799-7363.*

## IC-02A(T) HAND-HELD

Icom has announced the IC-02A and the IC-02AT two-meter hand-helds. These compact multi-featured hand-helds are the same size as the IC-2A series but have features found on no other amateur hand-held.

*The Icom IC-02AT hand-held.*

The IC-02A and IC-02AT are designed to be compatible with all existing IC-2A accessories plus some new accessories. An important feature of the IC-02A series is that it has 32 PL tones built into the unit as standard. These tones are programmable from the front-panel pad and may be used with any frequency at any time.

Any frequency on 5-kHz spacing in the two-meter ham band may be called up in the IC-02A. All frequency entries as well as control functions for memory, scanning, etc., are selected by the 16-button pad on the face of the radio. Included are priority watch, scanning of both memories and programmable band scan, and DTMF on the IC-02AT model. The unit features 10 memories which store frequency, PL tone, offset and offset direction, and an internal lithium battery backup. The priority channel is a unique feature to the IC-02A and IC-02AT, as well as the custom LCD readout with an S-meter function.

The IC-02A series will run at 3 Watts with the standard BP3 battery pack, or at 5 Watts with an optional high-power battery pack. A long-life battery, 8.4 volts at 800 mA, will be available to double the working time of the standard 3-Watt-output unit. Batteries may be charged a variety of ways.

The IC-02A series has an environmentally-sealed case with O-ring seals to protect it against dirt and moisture. A heavy-duty aluminum back provides heat sinking for the 5 Watts of power.

A power connector is supplied on the top of the unit. Twelve volts applied there will power the unit as well as charge the battery pack.

For further information, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*

*Low-profile HT amplifier from Mirage.*

*The Model 510SA Smart Patch from CES.*

## NEW HEADSET

Telex has introduced a lightweight headset for hand-held land-mobile transceivers. The ProCom 352-IC weighs 2.6 ounces when worn with the headband. However, when the snap-on headband is removed, the headset weighs one ounce and can be clipped directly onto eye- or sunglass frames.

When using the headset, the radio remains on the operator's belt. There is no longer any need to hand-hold the radio for communications. The headset is equipped with an in-line push-to-talk switch which also clips to a belt.

A soft ear tip channels incoming messages directly to the operator's ear so communications are essentially private. The noise-cancelling electret microphone is designed for very close talking and transmits the operator's voice clearly even in high-noise environments. The electret mike is also immune to electromagnetic or radio-frequency interference so it can be operated effectively near power lines, large transformers, generators, broadcast towers, and other equipment which so often interferes with radio communications.

The headset plugs directly into Icom or Ten-Tec hand-held transceivers. The unit is available now at local two-way radio dealers. For more information, contact Norman Hansen at *Telex Communications, Inc., 9600 Aldrich Ave. S., Minneapolis MN 55420.*

## BUCCANEER SEALED ELECTRICAL CONNECTORS

A new line of English-made sealed connectors for use in hostile environments, named Buccaneer, has been announced by Radiokit, the US agent. The connectors, which are made in bulkhead, chassis, and in-line styles, are available in 2-, 3-, 6-, and 7-pin configurations as well as 50- or 75-Ohm BNC (coaxial) types for HF and VHF radio. They are waterproof, dust-

proof, rugged, and reasonably priced. The use of screw terminals or crimp connections provides ease of wiring and results in a surprisingly-small-size unit.

Originally designed for marine applications where the connecting and disconnecting of power and signal equipment is desired (i.e., search lights, generators, radios, radars, sonars, masthead antennas, etc.), these connectors can be used in most applications where reliability is essential. Other suggested uses are in dusty or damp locations and places where a connection is subject to physical abuse.

The units are made from a high-density fiberglass-filled nylon. At the cable-entry end, waterproof grommets may be changed for different cable diameters. The mating seal is achieved by a compressed O-ring. Each connector has its own captive screw-down weatherproof cap which also serves as a tool for assembly and disassembly of the connector. The 3-pin version is rated 10 A at 250 V.

For further information, contact *Radiokit, Box 411, Greenville NH 03048; (603)-878-1033.* Dealer inquiries invited. Reader Service number 478.

# RTTY LOOP

*Marc I. Leavey, M.D. WA3AJR*
*6 Jenny Lane*
*Pikesville MD 21208*

I left a few items hanging last month; this month I will see if I can tidy up those few things. First off, we had looked at the problem of running a Murray-encoded teleprinter off of a computer's ASCII output.

If only it were the other way, things with a hardware solution (as we indicated would be looked at) would be a lot easier. Transforming Murray to ASCII involves a rather simple hookup (which can be accomplished with a PROM or two, a UART or two, and a few support chips), but converting the other way is quite a bit more complex. One reason for this is the problem of case-shifting in Murray. Although the ASCII machine may put out a simple string, say a callsign, as "W-A-3-A-J-R" straightaway, sending the same string in Murray involves the shift characters, sending "W-A-FIGS-3-LTRS-A-J-R." These must be inserted in the proper place with the stream of data coming downline.

Another major problem is the speed of transmission. As we discussed last month, most ASCII transmissions are running a good deal faster than Murray, and if you allow for the necessity of inserting occasional LTRS and FIGS characters, the effective data rate becomes even slower.

With this in mind, take a look at Fig. 1. This circuit was originally published here in *73* in September, 1977, in an article written by J. Gary Mills VE4CM. Although the design may resemble a work of modern art to the novice, it really is quite straightforward and one of the best of the lot that I have seen. Serial ASCII is accepted by the 1013 UART at the left, and the parallel output is decoded by a specially programmed PROM into the Murray equivalent. The data stored in the ROM includes a bit to indicate the case of the character, and tests are performed on the data stream to insert the proper case shift where indicated.

A clock circuit, shown in Fig. 2, is used to drive the Murray output at any popular speed from 60 wpm to 100 wpm (45.45 baud to 75 baud). The speed of the ASCII portion of the circuit is fixed at 110 baud, commonly called 100 wpm. Please don't confuse 100 wpm Murray (75 baud) with 100 wpm ASCII (110 baud). It has to do with the greater number of data bits (11 in ASCII, 7.46 in Murray) and the need to send them faster to get the same number of characters out. If you still don't follow, reread last month's column, calculator in hand.

In order to interface this circuit with a teleprinter, the scheme presented in Fig. 3 may be useful. This will serve to connect this, or any other TTL-level output, to drive a Model 33 or Model 35 Teletype® machine. I think it may come in handy for many an application.

What about that PROM, you say? Well, the author of the original article presented an abbreviated coding table for the code conversion. Presented here as Fig. 4, it is, I agree, a bit sketchy. You can get the idea, however, and the complete diagram may still be available from the author of the article or VE4 Logic, 76 St. Clair Blvd., Winnipeg, Manitoba, Canada R2C 0V2.

The second line I left dangling was a new RTTY program written by Clay Abrams K8AEP. Well, Clay has done it again! NEWRTYCW is a program written for a TRS-80C Color Computer with 16K or more memory which does not require Extended Basic or a disk to run (more on that last point later). It enables the CoCo to send and receive Murray RTTY, ASCII RTTY, and Morse CW at essentially any speed.

This machine-language program is supplied on a cassette tape which CLOADMs and executes automatically. This makes it impossible to load and look at or duplicate with the SAVEM command. After booting, the program asks for your callsign or other ID, up to 31 characters which can be sent at a keystroke.

The program itself is rather striking in all its abilities. There are four small "station" buffers, 254-byte buffers which are useful for storing three or four lines of text. Also available is a keyboard buffer,

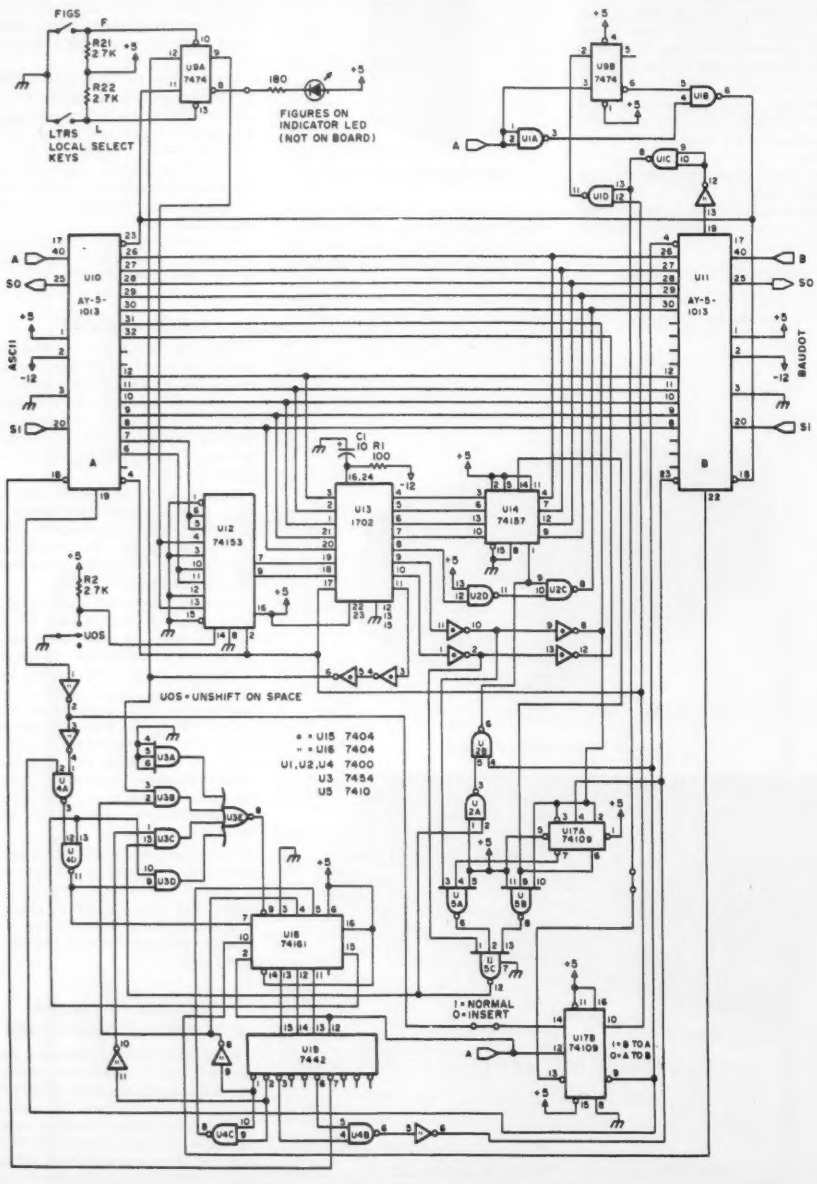


*Fig. 1. ASCII-to-Murray converter.*

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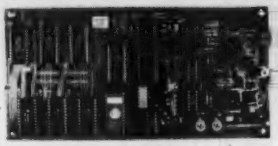

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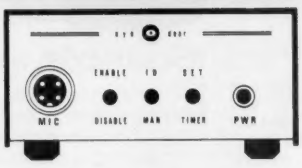


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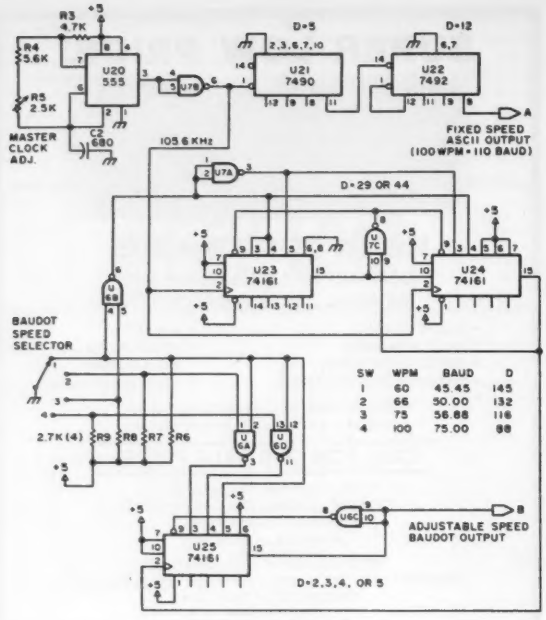


*Fig. 2. Clock driver circuit.*

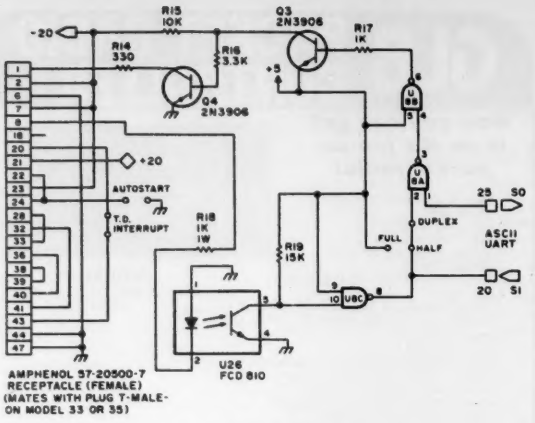


*Fig. 3. Teleprinter interface.*

12K in size on a 32K machine, and a receive buffer of equal size. These buffers may be loaded from tape, saved to tape, or printed out on the system printer. There is also a raft of features. Let's look at a few of them.

On RTTY, an automatic CR/LF pair may be generated, if desired, after the character in the tenth through eightieth column. At which position to limit, if at all, is easily specified. Station buffers, keyboard buffer, or even the receive buffer may be transmitted with a keystroke. Unshift on space is supported and may be turned off if desired. The number of carriage returns sent may be changed from the default of one up to nine. This is useful on some circuits, such as MARS, where I well remember the required CR-CR-LF-LTS-LTS sequence. There is even an automatic RY generator!

When operating CW, the functions are essentially the same as with RTTY, with a few exceptions. The speed of the incoming station is tracked, with transmit speed being set ahead of time. All the buffers work the same, as do the features, except that the RY test does not send Morse Vs. However, there is a code-practice option which sends random five-character groups with the audio heard over the TV set speaker. By the way, the CW portion provides several keys for "specialized" signals: the @ key is the BT (—...—), $ is the AR (.—.—.), the * is the AS (.—...), and several others.

Now, there are a few problems with this program. Sorry, Clay, but I do have my opinion! First of all, this is a self-booting tape. While I have no need to copy it, I would like to transfer it to disk, at least to load it. That cannot be done, as it assumes control of the machine as soon as it loads.

Secondly, saves and loads can only, currently, be made with tape. Clay does indicate, however, that a disk version is in the works.

And finally, if you have the CW transmit speed set, say, at 15 wpm and tune in a station sending at five, your response will stay at the faster speed unless you break out of the receive routine and reset the speed. Kind of messy. Two possible solutions would be to have the sending speed approximate the receiving speed (optionally, of course) or to have a control function reset the speed while still receiving.

One more thing—the keyboard input seems a little sluggish on my CoCo2. When Tandy upgraded the Basic ROMs, they moved the routine that polls the keyboard for input by a few bytes. If this program is using the old address, that would explain the sluggishness. I can't check it because of the "locked" nature of the program.

The solution is to use extended indirect addressing instead of plain extended addressing. It only takes one byte of data, but it would mean reassembling the whole program. Oh well, something more to think about!

All in all, this program looks hard to beat. Clay says that he is selling them like hotcakes. I am sure he would like to hear from you. Drop him a note care of Clay Abrams Software, 1758 Comstock Lane, San Jose CA 95124, and tell him WA3AJR sent you!

Now, a lot of you have been writing me notes and asking for a repeat of some of the basics. I don't think that reruns here are in order, but I will agree that there are many newcomers out there who might benefit from a review of material printed here several years ago. Therefore, I cautiously announce a new service. I shall try to put together on a monthly basis a compendium of RTTY material to be available by mail from the above address. The first edition will be an elementary introduction to RTTY, with other topics to follow in future months. Such items as RTTY reception, transmission, and machines are some of the items I hope to review. I shall announce each edition here as it becomes available.

To receive your copy, just send $2.00 and a self-addressed, stamped envelope (or sufficient US funds for foreign postage) to me at the above address. I hope this answers the needs expressed in so many of your letters. Watch this column for announcements of future editions.

Next month begins our eighth year of RTTY Loops. It is sure to be exciting, so be sure your subscription to *73* is current and watch for each month's RTTY Loop.

| Address | | Data | | | |
|---|---|---|---|---|---|
| Hex | Binary | Hex | Binary | Character | Purpose |
| 00 | 00000000 | 40 | 01000000 | NUL | |
| 01 | 00000001 | FF | 11111111 | | ASCII to Baudot |
| ... | | | | | |
| 1B | 00011011 | 5B | 01011011 | ESC | Cntl and Figs. |
| ... | | | | | |
| 30 | 00110000 | 36 | 00110110 | 0 | |
| 31 | 00110001 | 37 | 00110111 | 1 | |
| 3F | 00111111 | 39 | 00111001 | ? | |
| 40 | 01000000 | FF | 11111111 | | |
| 41 | 01000001 | 03 | 00000011 | A | ASCII to Baudot |
| 42 | 01000010 | 19 | 00011001 | B | |
| ... | | | | | Letters |
| 61 | 01100001 | 03 | 00000011 | a | |
| 62 | 01100010 | 19 | 00011001 | b | |
| ... | | | | | |
| 7F | 01111111 | 5F | 01011111 | RO | |
| 80 | 10000000 | 00 | 00000000 | BLNK | |
| 81 | 10000001 | 45 | 01000101 | E | Baudot to ASCII |
| ... | | | | | |
| 9B | 10011011 | 82 | 10000010 | FIGS | Unshifted |
| 9C | 10011100 | 4D | 01001101 | M | |
| 9D | 10011101 | 58 | 01011000 | X | |
| 9E | 10011110 | 56 | 01010110 | V | |
| 9F | 10011111 | 7F | 01111111 | LTRS | |
| A0 | 10100000 | 80 | 10000000 | BLNK | |
| A1 | 10100001 | B3 | 10110011 | 3 | Baudot to ASCII |
| ... | | | | | |
| BE | 10111110 | BB | 10111011 | ; | Shifted |
| BF | 10111111 | 7F | 01111111 | LTRS | |
| C0 | 11000000 | 80 | 10000000 | BLNK | |
| ... | | | | | Auto unshift |
| DF | 11011111 | 7F | 01111111 | LTRS | on space |
| E0 | 11100000 | FF | 11111111 | | |
| ... | | | | | Unused |
| FF | 11111111 | FF | 11111111 | | |

*Fig. 4. Abbreviated PROM coding list.*


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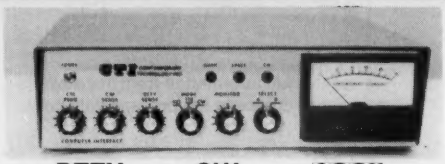

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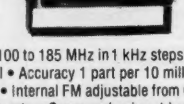

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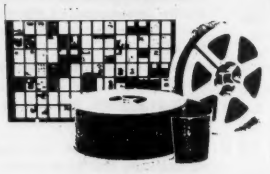

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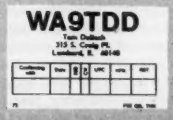

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## THE WONDROUS WWV—PART 2

Have you been listening to WWV at 18 minutes after the hour as I suggested last month? If not, turn on your receiver, tune in WWV at 10000.000 kHz, and listen as you read this.

In addition to its main function of providing a time and frequency standard, WWV also disseminates information for other government agencies. Included are storm warnings at 8–10 minutes after the hour and Omega navigation information at 16 minutes after (the Omega system is a VLF location system—10–14 kHz). The information of greatest interest to amateur-radio operators, especially DXers, is the Geoalert bulletins, at 18 minutes after each hour.

The information in these bulletins is produced by the National Oceanic and Atmospheric Administration (NOAA), which shares space in the same building as the National Bureau of Standards' master cesium-beam clock (see this column, last month.)

Every three hours an officer at the NOAA Space Environment Services Center in Boulder picks up a phone and calls a special drum recorder in the master clock room at the WWV transmitter site, 35 miles to the north in Fort Collins, Colorado. That drum is controlled in the same way as the drum which has the voice time announcements. When the 18th minute rolls around, the recording is broadcast on WWV. (You can also listen to the message by calling (303)-499-8129.)

The form of the message doesn't vary. First comes the solar-flux level from Ottawa, Canada. This is followed by the A index, the K index, and information on solar activity and geomagnetic storms. DXers can compile this information and use it to increase their DX efficiency, especially in times of low sunspots, such as now. Let's look at this information and see how it relates to DXing.

### The Solar Flux

The first item covered in the Geoalert bulletin is the solar flux. This is the amount of radiation coming from the sun at 2800 MHz, as measured in Ottawa. (Ottawa figures are used because they have been recorded since 1947 and they provide a consistent picture of the sun.) This solar-flux figure is directly related to the number of sunspots on the surface of the sun facing the Earth. It is easier and more consistent to measure the solar flux than to go through the somewhat arbitrary calculations of sunspot numbers. And solar flux can be measured when it's cloudy!

The solar-flux index ranges from 66 to about 250 or even higher. A reading of 66 is equivalent to zero sunspots—zilch! At about 80, there is enough radiation coming from the sun to open the 15- and 10-meter bands to some parts of the world. Higher readings suggest a better ionosphere, from the ham-radio point of view. What is most important about the solar flux, however, is the *trend* of the figures. A rising flux suggests improving band conditions; falling figures indicate the bands are deteriorating.

Also, the flux figures provide some predictive value for the next month. Since the solar flux is tied directly to sunspot activity and because the spots swing around as the sun rotates about once every 27 days, you can make some guesses about radio conditions 27 days ahead, based on today's figures. Alas, the sun is more fickle than this suggests. Even the largest spots have been known to completely disappear as they go around the back of the sun. And new spots spring up without warning. Still, the value of the flux 27 days ago is one of our best predictors of band conditions. Just don't bet your life on it.

Another useful predictor based on the solar flux is a sudden increase in its value. The extra radiation suggests that more particles will be streaming from the sun, and it's these ions, electrons, etc., which stir up the ionosphere and give us good DXing. These particles move at speeds less than that of light, so they arrive a day or two after the flux values change. So a sudden increase in solar flux suggests better band conditions in the next day or so.

To make the best use of the flux figures, you should write them in your log daily. Then compare radio propagation *at your QTH*, with *your* equipment, to the flux values. With time, you will begin to see how that solar flux correlates to DXing from your station. DX clubs often have a member who keeps track of the flux values on a daily basis and shares the data over a repeater. And some of the DX bulletins publish this information. But entering this figure daily in your own log is still the best way to track band openings. Try to get the figure soon after the 1800Z daily update.

### The Other Figures

While solar-flux level is a good predictor of future band conditions, the A and K indices provide a better idea of what is happening *now* on the bands. The A index is a figure between 0 and about 100 (although readings as high as 400 have been recorded). It is a measure of the geomagnetic activity of the Earth's magnetic field. When the A index is low, not much is happening, and signals pass with little attenuation or loss. An index reading of 10 or less suggests "quiet" conditions, just what the DXer ordered. As the sun starts acting up, however, the A index will rise, the Earth's magnetic field starts jumping around, and absorption increases. Your signals get weaker. At high absorption levels, you might as well turn off the radio and go mow the lawn or get reacquainted with your family.

Unfortunately, the A index is yesterday's news. Even though it is updated every three hours, it reflects what went on in the ionosphere yesterday. So when you hear a high value on the A index, you know that the bands stunk yesterday, something you were probably already aware of. This is similar to getting weather "forecasts" for the previous day.

So why pay any attention to the A index? First, the *trend* of the index is important. If the absorption level is rising, the bands will be getting worse. If it's falling, maybe you should anticipate spending more time on the air. Also, as with solar flux, the A index tends to repeat at 27-day intervals, as the sun rotates. A bad day (high A value) 27 days ago suggests today will be punko, too. Of course, the vagaries of the sun and a little Murphy keep this from becoming as simple as it seems.

The A index is especially meaningful as related to polar radio propagation and high-latitude east-west paths. The north-south paths are little affected even on days of high A readings. So consider swinging the beam to the south on days of high absorption.

The last figure given in the 18-minutes-after-the-hour Geoalerts is the K index. This is similar to the A index, except that it is much more current. It is actually measured right at the Boulder, Colorado, labs and updated every three hours like the A index. The K index varies from 0 to 5, with the higher numbers reflecting higher absorption, just as with the A index. A K reading of 4 or 5 suggests lawn mowing. A low K of 0 or 1 means it might be well worth tuning around the bands.

Again, the *trend* of the index is as important as the actual value. If the K index is higher than it was three hours ago, things are getting worse. Tell your spouse you'll go out to dinner after all. Decreasing K readings mean the absorption is lessening.

To recap these numbers, DXers pray for high solar flux and low A and K readings. A solar flux of 200, A = 3, and K = 0 would be a banner day to DXers. A flux of 85, A = 34, and K = 4 encourages even the most avid DXer to consider stamp collecting.

*Photo A. The control room at the Space Environment Services Center in Boulder, Colorado. Information on the state of the sun and the Earth's magnetic field pours into this communications hub and is distilled into the WWV bulletins at 18 minutes after the hour.*

### Storm Warnings

The last item on the Geoalerts is a description of solar activity, especially any solar flares. Flares are sudden eruptions on the surface of the sun which fling out enormous numbers of charged particles into space. Flares occur very suddenly, lasting a few minutes to a few hours.

Flares can be real disasters for DXers. The swarms of particles and ions rip up our ionosphere, sending absorption sky high (if you'll pardon the pun). A major flare can produce a Sudden Ionospheric Disturbance (SID). Most hams have experienced one or more of these: You turn on your rig and you hear nothing, absolutely nothing—not on any band. I once spent two hours ripping apart my station and tearing into my receiver, certain that something was seriously wrong. Of course, something *was* wrong, but with the ionosphere, not my station. It was several hours before the bands began slowly to return to normal.

There is nothing you can do about the SIDs. When one hits, turn off the radio and walk away. Unfortunately, we'll be seeing a lot more of these DX disasters in the next few years. With declining sunspot activity, SIDs tend to become more common. Also, there seems to be a vague 22-year cycle associated with SIDs, and the 1984–1985 range is 22 years after some of the most severe SIDs ever recorded.

Fortunately, WWV will give you some advance warning about SIDs. The Space Environment Services Center (SESC) monitors the X-ray output of the sun constantly. Information on the X-ray level pours into the Boulder labs from stations all over the globe and from two satellites above the Earth, GOES 5 and 6. This information reflects activity on the sun as currently as possible, with only an 8-minute delay for the speed of light.

The information on the X-ray flux is automatically charted on a video monitor (see Photo C) as one part of the SESC control desk (see Photo A). The office is manned 24 hours a day, with staff such as Master Sergeant Harry Sorg (see Photo B) keeping a close eye on any sudden changes in the value. The close-up photo of the video screen shows a Class M flare, serious enough to disrupt communications. A Class X flare wipes out everything, and a very powerful Class X flare can knock out power lines and do other physical damage. High-flying airliners on polar routes might be exposed to excessive radiation during flares. And persons living in high-latitude regions will be treated to a glorious aurora, which they might as well watch, since all radio propagation will be nonexistent!

But thanks to the time lag between when the flare starts (as indicated by the sudden burst of X-rays) and the time the particles which do the damage arrive (a day or so later), SESC can issue warnings to help reduce damage. And vital communications lines can be prepared for the coming radio blackout. When a major flare starts, Sergeant Sorg and his counterparts start notifying a list of customers that the particles are on the way. And they also put the information into the geophysical alerts at the end of the 18-minutes-after-the-hour WWV bulletins.

The SESC tries to predict flare activity based on complex models and studies of the sun. The magnetic fields around the sunspots, the relative motion of the spots, the flare history of a spot group, and other information is compiled and analyzed at the SESC office to generate this forecast of flare activity.

So when you hear the words "Solar ac-

*Photo B. Master Sergeant Harry Sorg points to the solar flare recorded on the video screen. X-ray data from ground stations and satellites reveals the current state of solar activity.*

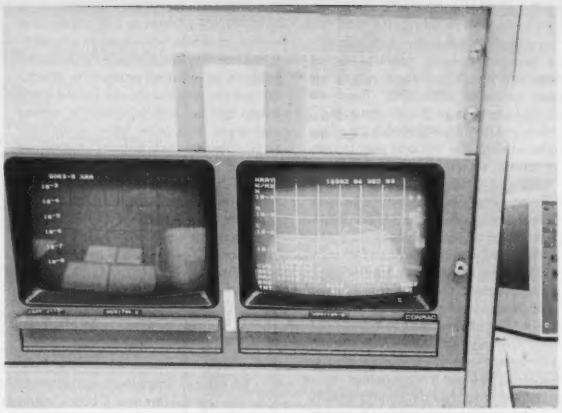

*Photo C. Close-up of the X-ray monitor screen showing a Class M solar flare at about 1545Z. In a day or two, radio propagation will be affected by the charged particles from this flare.*

tivity expected to be high" on the WWV bulletin, be prepared for some fireworks. On the other hand, the influx of solar radiation which arrives at the speed of light tends to increase the ionization of the atmosphere and *improve* radio propagation for a few hours. So a solar flare is a mixed blessing for DXers. The first few hours will be good radio operating times. In fact, some of the best possible propagation occurs just after the onset of a flare. But then the next day or so when the particles arrive: wipeout!

All of this information is packed into a few words, sandwiched between the tones, ticks, and beeps of the regular WWV information. And I haven't even mentioned some of the other data available from the WWV broadcasts, such as musical tones, standard audio frequencies, information on how fast the Earth is turning (listen for the ticks after the start of each minute!), and more.

The National Bureau of Standards and WWV provide a unique and useful service to amateur-radio operators and others throughout the world at remarkably low cost to the taxpayer. Keep them in mind the next time someone starts talking about government waste and inefficiency. And I would like to especially thank those NBS staffers and others who made my visit to the wondrous WWV and the Department of Commerce Boulder labs so informative and enjoyable: John Milton, Chief Engineer of WWV, Howard Machlan, WWV Engineer, Master Sergeant Harry Sorg, SESC staff, and especially Fred McGehan, Public Information Officer for the NBS.

That's it for this month. Next month we'll get down to some nitty-gritty about propagation and how you can use all of this information to improve your DX success. Meanwhile, listen to WWV at 18 minutes after the hour, tune into 14100, and log what you hear on that frequency. You'll be surprised at what you hear! I'll cover more on the Northern California DX Foundation beacon network in a future column. Good DX!

# REVIEW

## N2NY HAM MASTERTAPES

Well, I knew it would finally happen. These days just about anything you can imagine is showing up on videocassette. Movies, Broadway shows, hard-core porn, musicals, and training/instruction on just about everything from A as in apple growing to Z as in the training of zebras. It's all there for you to enjoy if you happen to own a home videocassette recorder and are willing to pay the price for the software.

Inevitably, the time would come when some enterprising ham would think in terms of training prospective amateurs using this developing media. Last spring, while visiting the east coast during the pre-production planning for "Amateur Radio's Newest Frontier," I was invited by Larry Horne N2NY to be a guest on his cable-TV program. It was then I learned that Larry had spent the better part of the past 24 months planning the production of an all-inclusive videotaped amateur-radio training program.

Training newcomers is nothing new to N2NY. He's been teaching amateur radio literally from the day he was first licensed, 32 years ago. His first graduates were his fellow grade-school students, and N2NY has been going strong ever since. His dream has always been that of making entry into the ranks of the US Amateur Service available to anyone who has the interest.

The release of the Ham MasterTapes training course by N2NY did pose one problem for publications such as this. Simply, neither *73* nor any other amateur-radio periodical had been put in the position of having to review a videotape. *73* was a bit luckier than the rest. They knew that one of their Associate Editors makes his living by "making television," and that's how it came to pass that this writer finds himself producing a review on the N2NY Ham MasterTapes.

The main question is whether or not the N2NY Ham MasterTapes are worth the $200 price tag. From my standpoint, the answer is in the affirmative, but in the end only you can make that judgment. Dollar-wise, they are an excellent investment for anyone planning to teach an amateur-radio school of any sort because they take away the need of having to solicit specialized equipment usually required for live demonstrations. It also does away with those embarrassing moments when a demonstration either fails or backfires in a way that nobody is expecting. A VHS or Beta home VCR and a color TV set replace the collection of gear that is usually necessary for such classes, and the demonstrations work perfectly every time.

I'm convinced that in his younger days, Larry was as addicted as I was to the NBC children's science program, "Watch Mr. Wizard." In his Ham MasterTapes, N2NY has utilized and expanded upon the tele-training methods developed—and still used by—television's teaching master, Don Herbert, the real Mr. Wizard. Those of you who were around during Mr. Wizard's tenure on NBC will remember that each week Don would spend 30 minutes every Saturday afternoon teaching one of the local kids what he called "the magic of science in everyday living." True, the local kid was a professional actor or actress, but the idea was that of educating by making learning fun. That's exactly the method utilized by Larry Horne in Ham MasterTapes.

Larry appears as much at home before a TV camera as he would be if you met him on the street. The fact is that this is actually the case. After several years of producing and hosting a weekly program, he has developed a very laid-back style of his own. This style, along with his obvious dedication to what he is doing, ranks him quite high on the list of educational television instructors. His on-camera presence helps counter the somewhat plastic performances of the others, which is about the only flaw in the entire production.

There are two methods of producing any film or videotape. One is Rehearse – Run-Thru – Rehearse/Tape – Air/Tape; the other is Block and Shoot. Larry's decision was to use the latter, and it appears to have been a wise move. It meant that an entire script did not need necessarily to be memorized at one time, and it permitted the use of prompting devices as well.

By using Block and Shoot, attention could be given to each individual aspect of the overall presentation, permitting attention to be paid to minute detail, simple things, such as the way an array of hand-held radios was placed on the table before the trio so that they were clearly visible on camera. Without several additional people to keep exact notes, it is all but impossible to use the earlier method without matching shots using an additional VCR playback for the purpose. By going to Block and Shoot, each scene could be done individually as many times as needed until Larry, as producer, was satisfied. The actual taping took five 10-hour work days. Again, by way of comparison, your TV sitcom usually takes only 4 hours total to tape, but at least 7 days . . . sometimes 20-hour days of preparation and rehearsal.

These days, it appears that a TV program is made or broken in post-production. That's another word for editing, and it's become an exacting science. Under Larry's personal supervision, the program was edited by his director, Christopher Stola, and the post-production phase is one of the high points. I say this based upon the minimal use of far-out special effects that might tend to confuse the viewer. Larry and Chris used the KISS Principle (keep it simple, stupid) with scene-to-scene transitions being the traditional "fade," and all transitions in a given segment being either straight cuts or cut-to-freeze-frame when a point needed emphasis.

In one place, Larry did get a bit liberal with his use of the freeze-frame, but it was something truly spectacular. Ever discharge a capacitor and notice a spark? Moves by pretty fast, doesn't it? Not in the Ham MasterTapes. Using stop-motion freeze, the viewer is treated to a spectacular fireworks-like display as the capacitor is discharged in a fiery fury. Almost something akin to the effects in "Star Wars," but not planned to be that way.

Every important point covered is emphasized by on-screen "fonts," i.e., texts superimposed on the screen, such as the name of a reporter on a news program. Larry uses fonts liberally as a way of permitting the viewer to take simple notes during the segments and review each subject after each of the 26 segments has been completed.

Just about everything you can think of (and some items you may not expect) are contained in the N2NY Ham MasterTapes. Larry does not stop at giving the minimum amount of information needed to pass an amateur examination. This is where most training courses end, leaving the student hung out to dry with a license and radio, but no experience with either. The traditions of amateur radio are rarely, if ever, included in programmed training courses. The so-called cheat books give only questions and answers. Most courses simply teach the minimum necessary to pass a

test. The N2NY Ham MasterTapes pick up where everyone else leaves off.

Larry has told this author quite candidly that learning how to operate various modes and rigs is important, but so are proper on-the-air procedures. There are also the traditions of the Amateur Radio Service, and they are included in the study course—things like the best way to conduct oneself on the air, entering a QSO, and operating a repeater. Even the way in which repeaters are coordinated to their channels by voluntary coordination councils is explained, and in detail. To put it concisely, everything other than CW is included in the N2NY Ham MasterTapes training program, and that puts it head and shoulders above just about anything else on the market.

As you sit and watch the Ham MasterTapes series, one thing comes across. The people who put them together really cared about what they were doing. Quality of production was obviously paramount to Larry and his crew, with cost of production taking a back seat. There would be very little I would change if it had been my show, except perhaps to use professional actors in place of volunteer students. While this may seem to be a contradiction in terms, as any good producer or director will tell you, the people who handle themselves best and appear natural on camera are those who have been specifically trained for that task. Each of us does one job best, and when actors are called for, I believe in using them. There's no substitute for experience.

I won't tell you the best way in which to use them, but whether you purchase the tapes for your personal use or to augment a training class run by your club, they are definitely a worthwhile investment. They have the ability to stand alone or be incorporated into a structured training program—and that's another part of their beauty. Any time a technical subject is broached and where needed demonstrations are included, Larry takes the time to stop and explain what he means in simple, easy-to-understand layman's terms. One thing is sure: Your students won't get bored.

The tapes are available on VHS and Beta formats at standard play speeds (Beta II and VHS-SP) so as to be compatible with just about any home VCR. Duplicating quality is what one would expect, being several tape generations down from the original masters, but they're on a par with most movie rental tapes. I would strongly recommend using multiple 25″ TV sets for showing to large groups. Avoid video projectors, as all home-video systems appear to become fairly grainy when used in conjunction with them. For at-home viewing, any 13″ to 25″ TV set will suffice.

At $199.95, the set of tapes is not cheap, but it is definitely a good investment if you are among those working toward strengthening the US Amateur Service by bringing new amateurs to it.

For more information, write *Larry Horne N2NY, Ham MasterTapes, 295 Park Ave. South, New York NY 10010.* Reader Service number 476.

**Bill Pasternak WA6ITF**
**73 Associate Editor**
**Saugus CA**

### WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in 73? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

# LETTERS

## FATHER MORAN ARRIVES

I need your help in publishing the fact that Father Moran 9N1MM is coming to the US, arriving September 4. This will be his 60th year as a Jesuit missionary.

I am in charge of scheduling his trip all over the US and I am looking for DX clubs in the larger cities who would like to have him for a guest for 2 or 3 days.

Send all inquiries and donations to me.

**Edward F. Konop W3WGS**
**125 Wetzel Rd.**
**Pittsburgh PA 15209**

## EGO MISSPELLED

I just read your "Ego" editorial in the February issue of *73* and noted the spelling error: It's spelled E-N-E-R-G-Y. Your subscription-chucking critics are jealous of the energy that jumps off the page at me.

I am at the moment earning radio money as I write. I am a part-time security guard at the dead heart of what was once a huge restaurant empire. It's all being sold off, from semitrailer trucks down to Sanka—desks, pencils, meat massagers, all lying in heaps on the once-busy warehouse floor. It's like visiting the home of a recent widow, before she's cleared out all the guy's stuff. What happened? Shortsightedness, greed, and *lazy thinking*!

One hears of bankruptcies by the score (9 out of 10 new businesses quickly fail, I hear), and people wonder why anyone would even try to start a new business. Or a magazine. As I learned from a bunch of soap salesmen, though, anything is possible—as long as you get off your butt and go after it, rather than sit in front of a TV and wait for somebody to throw success in your lap. I'd like to thank you for saying the same basic thing. You are helping me keep a new leaf turned, to have goals instead of wishes.

Included in my rounds through the moribund imperial seat of Sambo's is their print shop full of Heidelberg presses, paper, a darkroom, etc. I started a college newspaper with some other oddballs and ran it for the two years I was there, so the smells of ink, developer, paper, and wax conjure forth some powerful memories. As I remember what fun the whole process is, from writing and paste-up to printing and feedback, I realize that both you and your niche are lucky to have found each other. Keep having fun. I am with you all in spirit.

Anyhow, I enjoyed your magazine and editorial and thought I'd write and feed your ego. Drat. Now *I* misspelled it.

**Lyle D. Gunderson**
**Santa Barbara CA**

## BITTERSWEET VICTORY

I read with great interest the March issue of *73*. The diaries of those trying to contact STS-9-W5LFL were very exciting to read, even though few were successful.

Unlike some other ham magazines, *73* prints real-people experiences and brings us right into their ham shacks.

I didn't think to write about my W5LFL "contact" but it may be of some interest. At 13:07Z on December 6 (orbit 128) I used an Azden PCS-2000 borrowed from my neighbor next door, Charlie Newman KA4TRF, a 2-meter home-brew quad (K4HDV), and my Curtis KB4900 keyboard, set for 18 wpm. I sent, "W5LFL de W8SJO AR K," to which (during my repeating several times) Charlie came running in the front door (13:08Z) yelling, "You did it! Stop transmitting! He answered you—he said, 'W8SJO, this is W5LFL in the spacecraft, *Columbia*, acknowledging your CW call.'" And then Charlie said he faded away.

I am feeling it was a rather bittersweet victory. Not only because I personally didn't hear it, but also because my "contact" (yet to be confirmed—on this pass in this area—west central Florida—he wasn't heard answering anyone else) resulted in suspicion, denial, accusation of fabrication, disbelief, and alienation of some former hams who I thought were friends.

After the Sarasota newspaper (*Herald Tribune*, January 4, 1984) printed my story, one particular "friend" was in a state of rage. To this day he hasn't spoken. I feel sorry that a facet of ham radio has become a source of envy, jealousy, and animosity, instead of a comradery which comes from mutual respect and admiration of each of our own personal accomplishments.

Most of the hams are very supportive and congenial to me still. Most feel as I do... it really is no big deal... they know the facts. But I wanted to write this to perhaps bring up a point that I doubt has been really considered.

Personally, I'm bedfast most of the time, on oxygen, and ham radio (especially high-speed CW) is really a great hobby for me. I don't understand how we could have become so competitive in our avocation that the human element of fraternal socialization is being lost.

**Barry G. Yoder W8SJO**
**Bradenton FL 33529**

## BIASED STORY

Your extensive coverage of the W5LFL DXpedition in space leaves me feeling that hams are trying to tell only the good part of the story. Oh, there were a few mentions of transmissions on the downlink. And Wayne Green passed off the negative aspects of the operation with three sentences, ending with, "the usual crapola."

I do not wish to take away from the significance of this historic moment for our hobby, but I came away with a different perspective.

Never in my experience has any event been so well publicized. The frequencies were published far in advance in magazine after magazine. In our area, 2-meter repeater nets went over the game plan in agonizing detail. Goddard and Houston were on HF with complete and updated information. And much more!

Yet, in the Dallas Metroplex area, you would think the whole thing came about on the spur of the moment. One of the really good passes by W5LFL was clobbered in part by "turkeys" on the downlink and "policemen" yelling at the turkeys. I understand it was worse in many other areas. The whole time Owen was in space, the conduct of hams in this area proved that maybe we need an intelligence test for hams, rather than a code or theory test.

Hams had better quit yapping about what a great asset we will be in a "real emergency." If we as a group cannot handle a simple air-to-ground commo exercise, with everything laid out for months in advance, what will we do if that "real emergency" comes up?

I am ashamed to play my tapes of Owen's transmissions to anyone outside the hobby. In a way, we are managing news, by telling only part of the story. We get real upset with the White House or CBS or *The New York Times* if they do that.

**Richard C. Rhodes KH6IO**
**Dallas TX**

## OVERKILL

A ham operating from space is certainly a great event in the history of amateur radio and worthy of an article or two in any amateur-radio publication. The 22 stories taking up 32 pages in the March *73* seems a complete overkill. 22 consecutive articles on how to install PL-259 connectors would be just as interesting and informative.

**Bruce A. Wilke KB0UV**
**Wapello IA**

## ECLIPSE NET

A unique opportunity to aid the scientific community will occur on May 30 for hams in the southeastern and mid-Atlantic states. On that date the moon will pass between the sun and Earth, causing a solar eclipse visible across portions of eight states: Alabama, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, and Virginia.

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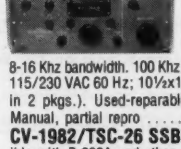

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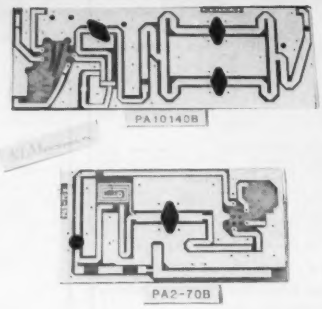


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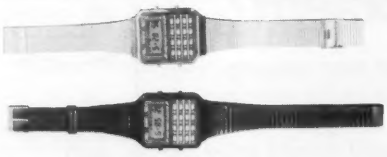

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| BFX86 | 2.50 |
| BFX89 | 1.00 |
| BFY11 | 2.50 |
| BFY18 | 2.50 |
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| BLX67 | 15.24 |
| BLX68C3 | 15.24 |
| BLX93C3 | 22.21 |
| BLY87A | 8.94 |
| BLY88C3 | 13.08 |
| BLY94C | 21.30 |
| BLY351 | 10.00 |
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| TRW | |
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| M1132 | 11.95 |
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| MEL80091 | 25.00 |
| MM1550 | 10.00 |
| MM1552 | 50.00 |
| MM1553 | 50.00 |
| MM1614 | 10.00 |
| MM1943/2N4072 | 1.80 |
| MM2608 | 5.00 |
| MM3375A | 17.10 |
| MM4429 | 10.00 |
| MM8000 | 1.15 |
| MM8006 | 2.30 |
| MM8011 | 25.00 |
| MPF102 | .45 |
| MPSU31 | 1.01 |
| MRA2023-1.5 | 42.50 |
| MRF208 | 16.10 |
| MRF212 | 16.10 |
| MRF223 | 13.25 |
| MRF224 | 15.50 |
| MRF231 | 10.92 |
| MRF232 | 12.07 |
| MRF233 | 12.65 |
| MRF237 | 3.15 |
| MRF238 | 13.80 |
| MRF239 | 17.25 |
| MRF245 | 35.65 |
| MRF247 | 35.65 |
| MRF304 | 43.45 |
| MRF309 | 33.81 |
| MRF314 | 28.52 |
| MRF315 | 28.86 |
| MRF316 | POR |
| MRF317 | 63.94 |
| MRF420 | 20.00 |
| MRF421 | 36.80 |
| MRF422A | 41.40 |
| MRF427 | 17.25 |
| MRF428 | 46.00 |
| MRF433 | 12.07 |
| MRF449/A | 12.65 |
| MRF450/A | 14.37 |
| MRF453/A | 18.40 |
| MRF454/A | 20.12 |
| MRF455/A | 16.00 |
| MRF458 | 20.70 |
| MRF463 | 25.00 |
| MRF472 | 1.00 |
| MRF475 | 3.10 |
| MRF476 | 2.00 |
| MRF477 | 14.95 |
| MRF492 | 23.00 |
| MRF502 | 1.04 |
| MRF503 | 6.00 |
| MRF504 | 7.00 |
| MRF509 | 5.00 |
| MRF511 | 10.69 |
| MRF515 | 2.00 |
| MRF517 | 2.00 |
| MRF559 | 2.05 |
| MRF605 | 20.00 |
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| PT8633 | POR |
| PT8639 | POR |
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| 40081 | 5.00 |
| 40279 | 10.00 |
| 40280 | 4.62 |
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| 40292 | 13.05 |
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| SD1009-2 | 15.00 | SD1133-1 | 14.00 | SD1290-4 | 15.00 | SD1480 | 60.00 |
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| SD1012-3 | 9.90 | SD1135 | 8.00 | SD1300 | 3.00 | SD1484-5 | 1.50 |
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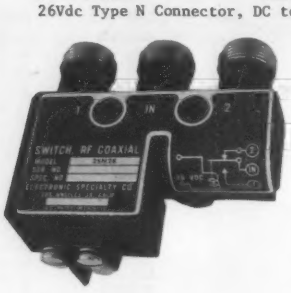


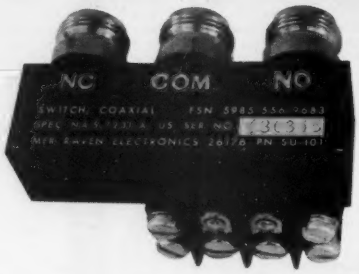


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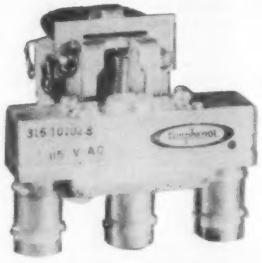

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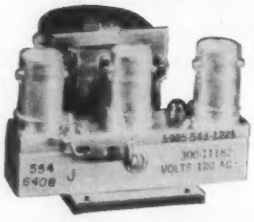

FXR
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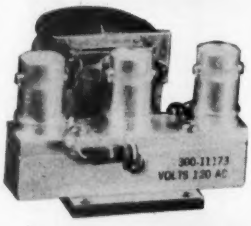

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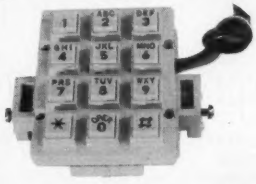
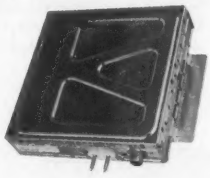


$9.99 or 10/$89.99

MITSUMI UHF/VHF VARACTOR TUNER MODEL UVE1A

Perfect for those unscrambler projects. New with data.



$19.99 or 10/$149.99

| INTEGRATED CIRCUIT. | | 1 to 10 | 11up |
|---|---|---|---|
| MC1372P | Color TV Video Modulator Circuit. | $ 4.42 | $2.95 |
| MC1358P | IF Amp.,Limiter,FM Detector,Audio Driver,Electronic Attenuator. | 5.00 | 4.00 |
| MC1350P | IF Amplifier | 1.50 | 1.25 |
| MC1330A1P | Low Level Video Detector | 1.50 | 1.15 |
| MC1310P | FM Stereo Demodulator | 4.29 | 3.30 |
| MC1496P | Balanced Modulator/Demodulator | 1.50 | 1.25 |
| LM565N | Phase Locked Loop | 2.50 | 2.00 |
| LM380N14 | 2Watt Audio Power Amplifier | 1.56 | 1.25 |
| LM1889N | TV Video Modulator | 5.00 | 4.00 |
| NE564N | Phase Locked Loop | 10.00 | 8.00 |
| NE561N | Phase Locked Loop | 10.00 | 8.00 |

FERRANTI ELECTRONICS AM RADIO RECEIVER MODEL ZN414 INTEGRATED CIRCUIT.
Features:
1.2 to 1.6 volt operating range.,Less than 0.5ma current consumption. 150KHz to 3MHz Frequency range.,Easy to assemble,no alignment necessary. Effective and variable AGC action., Will drive an earphone direct. Excellent audio quality.,Typical power gain of 72dB.,TO-18 package. With data. $2.99 or 10 For $24.99

NI CAD RECHARGEABLE BATTERIES

AA Battery Pack of 6 These are Factory New. $5.00

SUB C Pack of 10 2.5Amp/Hr. $10.00

Gates Rechargeable Battery Packs

12vdc at 2.5Amp/Hr. $11.99
12vdc at 5Amp/Hr. $15.99

MOTOROLA MRF559 RF TRANSISTOR
hfe 30min 90typ 200max.
ft 3000mhz
gain 8db min 9.5typ at 870mhz
13db typ at 512mhz
output power .5watts at 12.5vdc at 870mhz.

$2.05 or 10/$15.00

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# "SOCKETS AND CHIMNEYS"

EIMAC TUBE SOCKETS AND CHIMNEYS

| | | $POR |
|---|---|---|
| SK110 | Socket | $520.00 |
| SK300A | Socket For 4CX5000A,R,J, 4CX10,000D, 4CX15,000A,J | 260.00 |
| SK400 | Socket For 4-125A,250A,400A,400C,4PR125A,400A,4-500A,5-500A | 74.00 |
| SK406 | Chimney For 4-250A,400A,400C,4PR400A | 36.00 |
| SK416 | Chimney For 3-400Z | 390.00 |
| SK500 | Socket For 4-1000A/4PR1000A/B | 51.00 |
| SK600 | Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ | 73.00 |
| SK602 | Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ | 11.00 |
| SK606 | Chimney For 4CX250B,BC,FG,R,4CX350A,F,FJ | 60.00 |
| SK607 | Socket For 4CX600J,JA | 60.00 |
| SK610 | Socket For 4CX600J,JA | 66.00 |
| SK620 | Socket For 4CX600J,JA | 10.00 |
| SK626 | Chimney For 4CX600J,JA | 66.00 |
| SK630 | Socket For 4CX600J,JA | 34.00 |
| SK636B | Chimney For 4CX600J,JA | 36.00 |
| SK640 | Socket For 4CX600J,JA | 71.00 |
| SK646 | Chimney For 4CX600J,JA | 225.00 |
| SK700 | Socket For 4CX300A,Y,4CX125C,F | 225.00 |
| SK711A | Socket For 4CX300A,Y,4CX125C,F | 86.00 |
| SK740 | Socket For 4CX300A,Y,4CX125C,F | 86.00 |
| SK770 | Socket For 4CX300A,Y,4CX125C,F | 225.00 |
| SK800A | Socket For 4CX1000A,4CX1500B | 40.00 |
| SK806 | Chimney For 4CX1000A,4CX1500B | 225.00 |
| SK810 | Socket For 4CX1000A,4CX1500B | 300.00 |
| SK900 | Socket For 4X500A | 57.00 |
| SK906 | Chimney For 4X500A | 650.00 |
| SK1420 | Socket For 5CX3000A | 585.00 |
| SK1490 | Socket For 4CV8000A | |

JOHNSON TUBE SOCKETS AND CHIMNEYS

| | | |
|---|---|---|
| 124-111/SK606 | Chimney For 4CX250B,BC,FG,R, 4CX350A,F,FJ | $ 10.00 |
| 122-0275-001 | Socket For 3-500Z, 4-125A, 250A, 400A, 4-500A, 5-500A | (pair)15.00 |
| 124-0113-00 | Capacitor Ring | 15.00 |
| 124-116/SK630A | Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ | 55.00 |
| 124-115-2/SK620A | Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ | 55.00 |
| | 813 Tube Socket | 20.00 |

TUBE CAPS (Plate)

| | |
|---|---|
| HR1, 4 | $11.00 |
| HR2,3, 6 & 7 | 13.00 |
| HR5, 8 | 14.00 |
| HR9 | 17.00 |
| HR10 | 20.00 |

CHIP CAPACITORS

| | | | |
|---|---|---|---|
| .8pf | 10pf | 100pf* | 430pf |
| 1pf | 12pf | 110pf | 470pf |
| 1.1pf | 15pf | 120pf | 510pf |
| 1.4pf | 18pf | 130pf | 560pf |
| 1.5pf | 20pf | 150pf | 620pf |
| 1.8pf | 22pf | 160pf | 680pf |
| 2.2pf | 24pf | 180pf | 820pf |
| 2.7pf | 27pf | 200pf | 1000pf/.001uf* |
| 3.3pf | 33pf | 220pf* | 1800pf/.0018uf |
| 3.6pf | 39pf | 240pf | 2700pf/.0027uf |
| 3.9pf | 47pf | 270pf | 10,000pf/.01uf |
| 4.7pf | 51pf | 300pf | 12,000pf/.012uf |
| 5.6pf | 56pf | 330pf | 15,000pf/.015uf |
| 6.8pf | 68pf | 360pf | 18,000pf/.018uf |
| 8.2pf | 82pf | 390pf | |

PRICES: 1 to 10 - .99¢ 101 to 1000 .60¢ * IS A SPECIAL PRICE: 10 for $7.50
11 to 50 - .90¢ 1001 & UP .35¢ 100 for $65.00
51 to 100 - .80¢ 1000 for $350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

Frequency range 3.6 to 4.2GHz, Power ouput, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic ($nf_0$), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +-0.05 volts @ 55mA, Max.

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# TUBES

| TYPE | PRICE | TYPE | PRICE | TYPE | PRICE |
|---|---|---|---|---|---|
| 2C39/7289 | $ 34.00 | 1182/4600A | $500.00 | ML7815AL | $ 60.00 |
| 2E26 | 7.95 | 4600A | 500.00 | 7843 | 107.00 |
| 2K28 | 200.00 | 4624 | 310.00 | 7854 | 130.00 |
| 3-500Z | 102.00 | 4657 | 84.00 | ML7855KAL | 125.00 |
| 3-1000Z/8164 | 400.00 | 4662 | 100.00 | 7984 | 14.95 |
| 3B28/866A | 9.50 | 4665 | 500.00 | 8072 | 84.00 |
| 3CX400U7/8961 | 255.00 | 4687 | P.O.R. | 8106 | 5.00 |
| 3CX1000A7/8283 | 526.00 | 5675 | 42.00 | 8117A | 225.00 |
| 3CX3000F1/8239 | 567.00 | 5721 | 250.00 | 8121 | 110.00 |
| 3CW30000H7 | 1700.00 | 5768 | 125.00 | 8122 | 110.00 |
| 3X2500A3 | 473.00 | 5819 | 119.00 | 8134 | 470.00 |
| 3X3000F1 | 567.00 | 5836 | 232.50 | 8156 | 12.00 |
| 4-65A/8165 | 69.00 | 5837 | 232.50 | 8233 | 60.00 |
| 4-125A/4D21 | 79.00 | 5861 | 140.00 | 8236 | 35.00 |
| 4-250A/5D22 | 98.00 | 5867A | 185.00 | 8295/PL172 | 500.00 |
| 4-400A/8438 | 98.00 | 5868/AX9902 | 270.00 | 8458 | 35.00 |
| 4-400B/7527 | 110.00 | 5876/A | 42.00 | 8462 | 130.00 |
| 4-400C/6775 | 110.00 | 5881/6L6 | 8.00 | 8505A | 95.00 |
| 4-1000A/8166 | 444.00 | 5893 | 60.00 | 8533W | 136.00 |
| 4CX250B/7203 | 54.00 | 5894/A | 54.00 | 8560/A | 75.00 |
| 4CX250FG/8621 | 75.00 | 5894B/8737 | 54.00 | 8560AS | 100.00 |
| 4CX250K/8245 | 125.00 | 5946 | 395.00 | 8608 | 38.00 |
| 4CX250R/7580W | 90.00 | 6083/AZ9909 | 95.00 | 8624 | 100.00 |
| 4CX300A/8167 | 170.00 | 6146/6146A | 8.50 | 8637 | 70.00 |
| 4CX350A/8321 | 110.00 | 6146B/8298 | 10.50 | 8643 | 83.00 |
| 4CX350F/8322 | 115.00 | 6146W/7212 | 17.95 | 8647 | 168.00 |
| 4CX350FJ/8904 | 140.00 | 6156 | 110.00 | 8683 | 95.00 |
| 4CX600J/8809 | 835.00 | 6159 | 13.85 | 8877 | 465.00 |
| 4CX1000A/8168 | 242.50* | 6159B | 23.50 | 8908 | 13.00 |
| 4CX1000A/8168 | 485.00 | 6161 | 325.00 | 8950 | 13.00 |
| 4CX1500B/8660 | 555.00 | 6280 | 42.50 | 8930 | 137.00 |
| 4CX5000A/8170 | 1100.00 | 6291 | 180.00 | 6L6 Metal | 25.00 |
| 4CX10000D/8171 | 1255.00 | 6293 | 24.00 | 6L6GC | 5.03 |
| 4CX15000A/8281 | 1500.00 | 6326 | P.O.R. | 6CA7/EL34 | 5.38 |
| 4CW800F | 710.00 | 6360/A | 5.75 | 6CL6 | 3.50 |
| 4D32 | 240.00 | 6399 | 540.00 | 6DJ8 | 2.50 |
| 4E27A/5-125B | 240.00 | 6550A | 10.00 | 6DQ5 | 6.58 |
| 4PR60A | 200.00 | 6883B/8032A/8552 | 10.00 | 6GF5 | 5.85 |
| 4PR60B | 345.00 | 6897 | 160.00 | 6GJ5A | 6.20 |
| 4PR65A/8187 | 175.00 | 6907 | 79.00 | 6GK6 | 6.00 |
| 4PR1000A/8189 | 590.00 | 6922/6DJ8 | 5.00 | 6HB5 | 6.00 |
| 4X150A/7034 | 60.00 | 6939 | 22.00 | 6HF5 | 8.73 |
| 4X150D/7609 | 95.00 | 7094 | 250.00 | 6JG6A | 6.28 |
| 4X250B | 45.00 | 7117 | 38.50 | 6JM6 | 6.00 |
| 4X250F | 45.00 | 7203 | P.O.R. | 6JN6 | 6.00 |
| 4X500A | 412.00 | 7211 | 100.00 | 6JS6C | 7.25 |
| 5CX1500A | 660.00 | 7213 | 300.00* | 6KN6 | 5.05 |
| KT88 | 27.50 | 7214 | 300.00* | 6KD6 | 8.25 |
| 416B | 45.00 | 7271 | 135.00 | 6LF6 | 7.00 |
| 416C | 62.50 | 7289/2C39 | 34.00 | 6LQ6 G.E. | 7.00 |
| 572B/T160L | 49.95 | 7325 | P.O.R. | 6LQ6/6MJ6 Sylvania | 9.00 |
| 592/3-200A3 | 211.00 | 7360 | 13.50 | 6ME6 | 8.90 |
| 807 | 8.50 | 7377 | 85.00 | 12AT7 | 3.50 |
| 811A | 15.00 | 7408 | 2.50 | 12AX7 | 3.00 |
| 812A | 29.00 | 7609 | 95.00 | 12BY7 | 5.00 |
| 813 | 50.00 | 7735 | 36.00 | 12JB6A | 6.50 |

NOTE * = USED TUBE

NOTE P.O.R. = PRICE ON REQUEST

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# "FILTERS"

COLLINS Mechanical Filter #526-9724-010 MODEL F455Z32F

455KHZ at 3.2KHz wide. May be other models but equivalent. May be used or new. $15.99

ATLAS Crystal Filters

5.595-2.7/8/LSB, 5.595-2.7/LSB
8 pole 2.7KHz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-2.7/8/U, 5.595-2.7/USB
8 pole 2.7Khz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-.500/4, 5.595-.500/4/CW
4 pole 500 cycles wide CW. Impedance 800ohms 15pf In/800ohms 0pf out. 19.99

9.0USB/CW
6 pole 2.7KHz wide at 6dB. Impedance 680ohms 7pf In/300ohms 8pf out. CW-1599Hz 19.99

KOKUSAI ELECTRIC CO. Mechanical Filter #MF-455-ZL/ZU-21H

455KHz at Center Frequency of 453.5KC. Carrier Frequency of 455KHz 2.36KC Bandwidth.
Upper sideband. (ZU) 19.99
Lower sideband. (ZL) 19.99

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CRYSTAL FILTERS

| | | | |
|---|---|---|---|
| NIKKO | FX-07800C | 7.8MHz | $10.00 |
| TEW | FEC-103-2 | 10.6935MHz | 10.00 |
| SDK | SCH-113A | 11.2735MHz | 10.00 |
| TAMA | TF-31H250 | CF 3179.3KHz | 19.99 |
| TYCO/CD | 001019880 | 10.7MHz 2pole 15KHz bandwidth | 5.00 |
| MOTOROLA | 4884863B01 | 11.7MHz 2pole 15KHz bandwidth | 5.00 |
| PTI | 5350C | 12MHz 2pole 15KHz bandwidth | 5.00 |
| PTI | 5426C | 21.4MHz 2pole 15KHz bandwidth | 5.00 |
| PTI | 1479 | 10.7MHz 8pole bandwidth 7.5KHz at 3dB, 5KHz at 6dB | 20.00 |
| COMTECH | A10300 | 45MHz 2pole 15KHz bandwidth | 6.00 |
| FRC | ERXF-15700 | 20.6MHz 36KHz wide | 10.00 |
| FILTECH | 2131 | CF 7.825MHz | 10.00 |

**********

CERAMIC FILTERS

| | | | |
|---|---|---|---|
| AXEL | 4F449 | 12.6KC Bandpass Filter 3dB bandwidth 1.6KHz from 11.8-13.4KHz | 10.00 |
| CLEVITE | TO-01A | 455KHz+-2KHz bandwidth 4-7% at 3dB | 5.00 |
| | TCF4-12D36A | 455KHz+-1KHz bandwidth 6dB min 12KHz, 60dB max 36KHz | 10.00 |
| MURATA | BFB455B | 455KHz | 2.50 |
| | BFB455L | 455KHz | 3.50 |
| | CFM455E | 455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 50dB | 6.65 |
| | CFM455D | 455KHz +-7KHz at 3dB , +-10KHz at 6dB , +-20KHz at 50dB | 6.65 |
| | CFR455E | 455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 60dB | 8.00 |
| | CFU455B | 455KHz +-2KHz bandwidth +-15KHz at 6dB, +-30KHz at 40dB | 2.90 |
| | CFU455C | 455KHz +-2KHz bandwidth +-12.5KHz at 6dB , +-24KHz at 40dB | 2.90 |
| | CFU455G | 455KHz +-1KHz bandwidth +-4.5KHz at 6dB , +-10KHz at 40dB | 2.90 |
| | CFU455H | 455KHz +-1KHz bandwidth +-3KHz at 6dB , +-9KHz at 40dB | 2.90 |
| | CFU455I | 455KHz +-1KHz bandwidth +-2KHz at 6dB , +-6KHz at 40dB | 2.90 |
| | CFW455D | 455KHz +-10KHz at 6dB , +-20KHz at 40dB | 2.90 |
| | CFW455H | 455KHz +-3KHz at 6dB , +-9KHz at 40dB | 2.90 |
| | SFB455D | 455KHz | 2.50 |
| | SFD455D | 455KHz +-2KHz , 3dB bandwidth 4.5KHz +-1KHz | 5.00 |
| | SFE10.7MA | 10.7MHz 280KHz +-50KHz at 3dB , 650KHz at 20dB | 2.50 |
| | SFE10.7MS | 10,7MHz 230KHz +-50KHz at 3dB , 570KHz at 20dB | 2.50 |
| | SFG10.7MA | 10.7MHz | 10.00 |
| NIPPON | LF-B4/CFU455I | 455KHz +-1KHz | 2.90 |
| | LF-B6/CFU455H | 455KHz +-1KHz | 2.90 |
| | LF-B8 | 455KHz | 2.90 |
| | LF-C18 | 455KHz | 10.00 |
| TOKIN | CF455A/BFU455K | 455KHz +-2KHz | 5.00 |
| MATSUSHIRA | EFC-L455K | 455KHz | 7.00 |

**********

SPECTRA PHYSICS INC. Model 088 HeNe LASER TUBES

POWER OUTPUT 1.6MW. BEAM DIA. .75MM BEAM DIR. 2.7MR 8KV STARTING VOLTAGE DC
68K OHM 1WATT BALLAST 1000VDC +-100VDC At 3.7MA $59.99

ROTRON MUFFIN FANS Model MARK4/MU2A1

115 VAC 14WATTS 50/60CPS IMPEDENCE PROTECTED-F 88CFM at 50CPS $ 7.99
105CFM at 60CPS THESE ARE NEW

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# HEWLETT PACKARD SIGNAL GENERATORS

| | | |
|---|---|---|
| 606A | 50KHz to 65MHz in 6 bands +-1%,Output level adjustable 0.1uV to 3V into 50 ohms.Built-in crystal calibrator.400 -1000Hz modulation. | $ 650.00 |
| 606B | Same as above but has frequency control feature to allow operation with HP 8708A Synchronizer. | $1100.00 |
| 608C | 10MHz to 480MHz,0-1uV-1V into 50 ohms,AM,CW,or pulse modulation, calibrated attenuator. | $ 500.00 |
| 608D/ TS510 | 10MHz to 420MHz, 0.1uV-0.5V into 50 ohms,+-0.5% accuracy, built-in crystal calibrator, AM-CW or pulse output. | $ 375.00 |
| 608E | Improved version of popular 608C.Up to 1V output.Improved stability,low residual FM. | $1450.00 |
| 608F | 10MHz to 455MHz in 5 bands +-1% frequency accuracy with built-in crystal calibrator.Can be used with HP 8708A Synchronizer. Output continuously adjustable from .1uV to .5V into 50 ohms. | $1100.00 |
| 612A | 450-1230MHz ,0.1uV-0.5V into 50 ohms,calibrated output. | $ 750.00 |
| 614A | 900-2100MHz with many features including calibrated output and all modulation characteristics. | $ 500.00 |
| 616A/ TS403 | Direct reading and direct control from 1.8 to 4.2GHz. The H.P.616A features +-1.5dB calibrated output accuracy from -3127dBm to -dBm.The output is directly calibrated in microvolts and dBm with continuous monitoring. Simple operation frequency dial accuracy is +-1% and stability exceeds 0.005%-/ C change in ambient temperature. Calibrated attenuator is within +-1.5dB over entire output band. 50 ohm impedance unit has internal pulse modulation with rep rate variable from 40 Hz to 4KHz,variable pulsewidth(1 to 10usec)and variable pulse delay(3 to 300usec).External modulating inputs increas versatility. | $ 375.00 |
| 616B | Same as above but later model. | $ 600.00 |
| 618B | 3.8 to 7.66Hz range,with calibrated output and selection of pulse-FM or square wave modulation. | $ 600.00 |
| 618C | Same as above but later model. | $2200.00 |
| 620A | 7 to 11GHz range,with calibrated output and selection of pulse-FM or square wave modulation. | $ 750.00 |
| 620B | Same as above but later model. | $2200.00 |
| 626A | 10 to 15GHz,10mw output power with calibrated output and pulse-square wave or FM modulation. | $4200.00 |
| 8708A | Synchronizer used with 606B,608F.The synchronizer is a phase-lock frequency stabilizer which provides crystal-oscillator frequency stability to 430MHz in the 608F signal generator.Phase locking eliminates microphonics and drift resulting in excellent frequency stability.The 8708A includes a vernier which can tune the reference oscillator over a range of +-0.25% permitting frequency settability to 2 parts in 10 to the seventh.Provides a very stable signal that satisfies many critical applications. | (With HP 606B or 608F) $ 350.00<br>(Without) $ 450.00 |
| EMC-10 | ELECTROMETRICS EMC-10 RFI/EMI RECEIVER<br>Low frequency analyzer covering 20Hz to 50KHz frequency range.Extendable to 500 KHz in wideband mode. | $2500.00 |
| NF-105F | Empire Devices Field Intensity Meter.<br>Has NF-105/TA,NF-105/TX,NF-105/T1,NF-105/T2,NF-105/T3.<br>Covers 14KHz to 1000MHz. | $2100.00 |

ALL EQUIPMENT CARRY A 30 DAY GUARANTEE.

EQUIPMENT IS NOT CALIBRATED.

UNEX LABORATORIES THS-2 FLEXICOM HEADSET.

these headsets come with data to hook up to a ICOM radios and many other equipment.

Perfect for Airplanes , Helicopters , Mobile Radios , or Just the Telephone.

These Are Factory New In Sealed Boxes. Limited Supply Only $69.95

**TERMS:** DOMESTIC: Prepaid, C.O.D. or Credit Card
FOREIGN: Prepaid only, U.S. Funds, Money Order, or Cashier's Check Only.

**C.O.D.'** Acceptable by telephone or mail. Payment from customer will be by Cash, Money Order, or Cashier's Check. We are sorry but we cannot accept personal checks for C.O.D.'s. C.O.D.'s are shipped by air only and thru United Parcel Service.

**CONFIRMING ORDERS:** We would prefer that confirming orders not be sent after a telephone order has been placed. If company policy necessitates a confirming order, please mark "CONFIRMING" boldly on the order. If problems or duplicate shipments occur due to an order which is not properly marked, the customer will be held responsible for any charges incurred, plus a 15% restock charge on the returned parts.

**CREDIT CARDS:** We are now accepting MASTERCARD, VISA, AND AMERICAN EXPRESS

**DATA SHEETS:** When we have data sheets in stock on devices we will supply them with the order.

**DEFECTIVE MATERIALS:** All claims for defective materials must be made within 30 DAYS after receipt of the parcel. All claims must include the defective material (for testing purposes), a copy of our invoice, and a return authorization number which must be obtained prior to shipping the merchandise back to us. This can be obtained by calling (602) 242-8916 or sending us a postcard. Due to Manufacturer warranties we are unable to replace or issue credit on items which have been soldered to or have been altered in any way. All return items must be packed properly or it will void all warranties. We do not assume responsibility for shipping and handling charges incurred.

**DELIVERY:** Orders are usually shipped the same day they are placed or the next business day, unless we are out of stock on an item. The customer will be notified by post card if we are going to backorder the item. Our normal shipping method is UPS or U.S. Mail depending on size or the weight of the package. Test Equipment is shipped only by air and is freight collect, unless prior arrangements have been made and approved.

**FOREIGN ORDERS:** All foreign orders must be prepaid with a Cashier's Check, or Money Order made out in U.S. FUNDS ONLY. We are sorry but C.O.D. is not available to foreign countries and letters of credit are unacceptable as a form of payment. Further information is available on request.

**HOURS:** Monday thru Friday 8:30 a.m. to 5:00 p.m. Saturdays 8:30 a.m. to 4:00 p.m.

**INSURANCE:** Please include 25¢ for each additional $100.00 over $100.00, UPS ONLY. All insured packages are shipped thru UPS only. If you wish to have it shipped through the post office there is a $5.00 fee which is additional to the shipping, handling and insurance.

**OPEN ACCOUNTS:** We regret that we do not issue open accounts.

**ORDER FORMS:** New order forms are included with each order for your convenience. Additional order forms are available on request.

**PARTS:** We reserve the right to substitute or replace any item with a part of equal or comparable specification.

**POSTAGE:** Minimum shipping and handling in the U.S., Canada, and Mexico is $3.00 for ground shipments, all other countries is $5.50. Air rates are available at the time of your order. All foreign orders please include 25% of the ordered amount for shipping and handling. C.O.D.'s are shipped AIR ONLY.

**PREPAID ORDERS:** Orders must be accompanied by a check.

**PRICES:** Prices are subject to change without notice.

**PURCHASE ORDERS:** We accept purchase orders only when they are accompanied by a check.

**RESTOCK CHARGES:** If parts are returned to MHZ ELECTRONICS, INC. due to customer error, the customer will be held responsible for all fees incurred and will be charged a 15% RESTOCK CHARGE with the remainder in CREDIT ONLY. The following must accompany any return; A copy of our invoice, return authorization number which must be obtained prior to shipping the merchandise back. Returns must be done within 10 DAYS of receipt of parcel. Return authorization numbers can be obtained by calling (602) 242-8916 or notifying us by post card. Return authorizations will not be given out on our 800 number.

**SALES TAX:** ARIZONA residents must add 6% sales tax, unless a signed ARIZONA resale tax card is currently on file with us. All orders placed by persons outside of ARIZONA, but delivered to persons in ARIZONA are subject to the 6% sales tax.

**SHORTAGE OR DAMAGE:** All claims for shortages or damages must be made within 5 DAYS of receipt of parcel. Claims must include a copy of our invoice, along with a return authorization number which can be obtained by contacting us at (602) 242-8916 or sending a post card. Authorizations cannot be on our 800 number. All items must be properly packed. If items are not properly packed make sure to contact the carrier so that they can come out and inspect the package before it is returned to us. Customers which do not notify us within this time period will be held responsible for the entire order as we will consider the order complete.

OUR 800 NUMBER IS STRICTLY FOR ORDERS ONLY (800) 528-0180. INFORMATION CALLS ARE TAKEN ON (602) 242-8916 or (602) 242-3037.

✓48

MHz electronics

2111 W. CAMELBACK ROAD
PHOENIX, ARIZONA 85015

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

**Toll Free Number**
**800-528-0180**
**(For orders only)**

**For information call: (602) 242-3037**

**PRICES SUBJECT TO CHANGE WITHOUT NOTICE.**

✓See List of Advertisers on page 114

# RAMSEY ELECTRONIC'S Inc.

# PARTS WAREHOUSE

We now have available a bunch of goodies too good to bypass. Items are limited so order today.

2575 Baird Rd.
Penfield, NY 14526
716-586-3950

Call your Phone Order in Today. TERMS: Satisfaction guaranteed or money refunded. C.O.D. add $2.50. Minimum order $6.00. Orders under $10.00 add $1.50. Add 6% for postage, insurance, handling. Overseas add 15%. N.Y. residents add 7% tax.

**MINI KITS - YOU HAVE SEEN THESE BEFORE NOW HERE ARE OLD FAVORITE AND NEW ONES TOO. GREAT FOR THAT AFTERNOON HOBBY.**

## FM MINI MIKE

A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.

FM-3 Kit **$14.95**
FM-3 Wired and Tested **29.95**

### Color Organ

See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110 VAC.

Complete kit, ML-1 **$8.95**

### Video Modulator Kit

Converts any TV to video monitor. Super stable, tunable over ch. 4-6. Runs on 5-15V, accepts std. video signal. Best unit on the market! Complete kit. VD-1 **$7.95**

### Led Blinky Kit

A great attention getter which alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights, anything! Runs on 3 to 15 volts. Complete kit, BL-1 **$2.95**

### Super Sleuth

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker. Complete kit, BN-9 **$5.95**

### CPO-1

Runs on 3-12 Vdc 1 watt out, 1 KHZ good for CPO, Alarm, Audio Oscillator. Complete kit **$2.95**

### FM Wireless Mike Kit

Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 kit **$3.95** FM-2 kit **$4.95**

### Whisper Light Kit

An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC. Complete kit, WL-1 **$6.95**

### Tone Decoder

A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts. Complete kit, TD-1 **$5.95**

### Universal Timer Kit

Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

UT-5 Kit **$5.95**

### Mad Blaster Kit

Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC.

MB-1 Kit **$4.95**

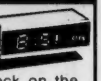
### Siren Kit

Produces upward and downward wail characteristic of a police siren. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker. Complete kit, SM-3 **$2.95**

### 60 Hz Time Base

Runs on 5-15 VDC. Low current (2.5ma) 1 min month accuracy TB-7 Kit **$5.50**
TB-7 Assy **$9.95**

## CLOCK KITS



**Your old favorites are here again. Over 7,000 Sold to Date. Be one of the gang and order yours today!**

Try your hand at building the finest looking clock on the market. Its satin finish anodized aluminum case looks great anywhere, while six .4" LED digits provide a highly readable display. This is a complete kit, no extras needed, and it only takes 1-2 hours to assemble. Your choice of case colors: silver, gold, black (specify).

Clock kit, 12/24 hour, DC-5 **$24.95**
Clock with 10 min. ID timer, 12/24 hour, DC-10 **$29.95**

For wired and tested clocks add $10.00 to kit price.
SPECIFY 12 OR 24 HOUR FORMAT

## SATELLITE TV KIT

SOLD OUT

image re… fully tunable audio to recover hidde… locat… divide by two PLL demodulator fo… eller… threshold performance, tight t… ing … to as…dre drift free reception, and of … se, h… 24 channel tunable coverage.

…ullite TV system around the R2B, c… to tho…sands others already have and now it's …ilable in kit form at a new low price. Order you… today.

'HE POPULAR SAT-TEC RECEIVER IN KIT-FO…

## NEW, LOWER PRICES!

Featured in a Radio … magazine cover story (May 82) … Sat-tec TV receiver is now … erating … hands of locations. The R2B is easy … build; pre-etched, plated h… …ered component layout assures … …ent placement and the critica… and local oscillator are preassembled and …igned! All parts are included for the P… tractive case, power supply, descriptive operating manual as well as complete assembly instructions. Features of the receiver include; dual conversion design for best

A complete Satellite TV System requires a dish antenna, LNA (low noise amplifier), Receiver and Modulator.

R2B Receiver Kit **$295.00**
R2B Receiver, Wired and Tested **$395.00**
120 ° K LNA **$295.00**
RM3 RF Modulator **$49.95**
Prices include domestic UPS shipping and insurance.

# PARTS PARADE

## IC SPECIALS

### LINEAR

| | |
|---|---|
| 301 | $ .35 |
| 324 | $1.50 |
| 380 | $1.50 |
| 555 | $ .45 |
| 556 | $1.00 |
| 565 | $1.00 |
| 566 | $1.00 |
| 567 | $1.25 |
| 741 | 10/$2.00 |
| 1458 | $ .50 |
| 3900 | $ .50 |
| 3914 | $2.95 |
| 8038 | $2.95 |

### CMOS

| | |
|---|---|
| 4011 | .50 |
| 4013 | .50 |
| 4046 | $1.85 |
| 4049 | .50 |
| 4059 | $9.00 |
| 4511 | $2.00 |
| 4518 | $1.35 |
| 5839 | $1.75 |

### TTL

| | |
|---|---|
| 74S00 | $ .40 |
| 7447 | $ .65 |
| 7475 | $ .50 |
| 7490 | $ .50 |
| 74196 | $1.35 |

### SPECIAL

| | |
|---|---|
| 11C90 | $15.00 |
| 10116 | $ 1.25 |
| 7208 | $17.50 |
| 7207A | $ 5.50 |
| 7216D | $21.00 |
| 7107C | $12.50 |
| 5314 | $ 2.95 |
| 5375AB/G | $ 2.95 |
| 7001 | $ 6.50 |

### FERRITE BEADS

With info and specs 15/$1.00
6 Hole Balun Beads 5/$1.00

### READOUTS

| | |
|---|---|
| FND 359 .4" C.C. | $1.00 |
| FND 507/510 .5" C.A. | 1.00 |
| MAN 72/HP7730 .33" C.A. | 1.00 |
| HP 7851 .43" C.A. | 2.00 |

### TRANSISTORS

| | |
|---|---|
| 2N3904 NPN C+F | 15/$1.00 |
| 2N3906 PNP C+F | 15/$1.00 |
| 2N4403 PNP C+F | 15/$1.00 |
| 2N4410 NPN C+F | 15/$1.00 |
| 2N4916 FET C+F | 4/$1.00 |
| 2N5401 PNP C+F | 5/$1.00 |
| 2N6028 C+F | 4/$1.00 |
| 2N3771 NPN Silicon | $1.50 |
| 2N5179 UHF NPN | 3/$2.00 |
| Power Tab NPN 40W | 3/$1.00 |
| Power Tab PNP 40W | 3/1.00 |
| MPF 102/2N5484 | $.50 |
| NPN 3904 Type T+R | 50/$2.50 |
| PNP 3906 Type T+R | 50/$2.50 |
| 2N3055 | $.60 |
| 2N2646 UJT | 3/$2.00 |

### Sockets

| | |
|---|---|
| 8 Pin | 10/$2.00 |
| 14 Pin | 10/$2.00 |
| 16 Pin | 10/$2.00 |
| 24 Pin | 4/$2.00 |
| 28 Pin | 4/$2.00 |
| 40 Pin | 3/$2.00 |

### Diodes

| | |
|---|---|
| 5.1 V Zener | 20/$1.00 |
| 1N914 Type | 50/$1.00 |
| 1KV 2Amp | 8/$1.00 |
| 100V 1Amp | 15/$1.00 |

25 AMP 100V Bridge **$1.50 each**

Mini-Bridge 50V 1 AMP 2 for $1.00

### Resistor Ass't

Assortment of Popular values - ¼ watt. Cut lead for PC mounting, ½" center, ½" leads, bag of 300 or more. **$1.50**

### Switches

Mini toggle SPDT **$1.00**
Red Pushbuttons N.O. **3/$1.00**

### Earphones

3" leads, 8 ohm, good for small tone speakers, alarm clocks, etc. 5 for $1.00

### Mini 8 ohm Speaker

Approx. 2¼" diam. Round type for radios, mike etc. **3 for $2.00**

### Solid State Buzzers

small buzzer 450 Hz, 86 dB, sound output on 5-12 vdc at 10-30 mA, TTL compatible **$1.50**

### Slug Tuned Coils

Small 3/16" Hex Slugs turned coil. 3 turns. 10 for $1.00

### AC Outlet

Panel Mount with Leads **4/$1.00**

### CAPACITORS

| TANTALUM Dipped Epoxy | | ALUMINUM Electrolytic | | DISK CERAMIC | |
|---|---|---|---|---|---|
| 1.5 uF 25V | 3/$1.00 | 1000 uF 16V Radial | $.50 | 01 16V disk | 20/$1.00 |
| 1.8 uF 25V | 3/$1.00 | 500 uF 20V Axial | $.50 | 1 16V | 15/$1.00 |
| .22 uF 25V | 3/$1.00 | 150 uF 16V Axial | $/$1.00 | 100 pF | 20/$1.00 |
| | | 10 uF 15V Radial | 10/$1.00 | 047 16V | 20/$1.00 |

### DC-DC Converter

+5 vdc input prod. -9 vdc @ 30ma
+9 vdc produces -15 vdc @ 35ma **$1.25**

### Trimmer Caps

25K 20 Turn Trim Pot **$1.00**
1K 20 Turn Trim Pot **$.50**

Sprague - 3-40 pf Stable Polypropylene .50 ea.

### Crystal Microphone

Small 1" diameter ¼" thick crystal mike cartridge **$.75**

### Coax Connector

Chassis mount BNC type **$1.00**

### 9 Volt Battery Clips

Nice quality clips **5 for $1.00**
¾" Rubber Grommets **10 for $1.00**

### Parts Bag

Asst. of chokes, disc. caps, tant. resistors, transistors, diodes, MICA caps etc. sm. bag (100 pc) **$1.00** lg. bag (300 pc) **$2.50**

### Connectors

6 pin type gold contacts for mA-1003 car clock module price .75 ea.

### Leds

- your choice, please specify
Mini Red, Jumbo Red, High Intensity Red, Illuminator Red **8/$1**
Mini Yellow, Jumbo Yellow, Jumbo Green **6/$1**

### Varactors

Motorola MV 2209 30 PF Nominal cap 20-80 PF - Tunable range - .50 each or 3/$1.00

### Crystals

| | |
|---|---|
| 3.579545 MHZ | $1.50 |
| 10.00000 MHZ | $5.00 |
| 5.248800 MHZ | $5.00 |

### AC Adapters

Good for clocks, nicad chargers, all 110 VAC plug one end

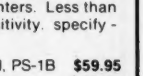
| | |
|---|---|
| 8.5 vdc @ 20 mA | $1.00 |
| 16 vac @ 160mA | $2.50 |
| 12 vac @ 250mA | $3.00 |

### Audio Prescaler

Make high resolution audio measurments, great for musical instrument tuning, PL tones, etc. Multiplies audio UP in frequency, selectable x10 or x100, gives .01 HZ resolution with 1 sec. gate time! High sensitivity of 25 mv, 1 meg input z and built-in filtering gives great performance. Runs on 9V battery, all CMOS.

PS-2 kit **$ 39.95**
PS-2 wired **$ 49.95**

### 600 MHz PRESCALER



Extend the range of your counter to 600 MHz. Works with all counters. Less than 150 mv sensitivity, specify - 10 or -100

Wired, tested, PS-1B **$59.95**
Kit, PS-1B **$44.95**

### 30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 30 W pwr amp kit **$ 24.95**
TR-1, RF sensed T-R relay kit **6.95**

MRF-238 transistor as used in PA-1 8-10db gain 150 mhz **$11.95**

RF actuated relay senses RF (1W) and closes DPDT relay. For RF sensed T-R relay TR-1 Kit **$6.95**

### Power Supply Kit

Complete triple regulated power supply provides variable 6 to 18 volts at 200 ma and +5 at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6.3 V ra 1 A and 24 VCT.
Complete kit, PS-3LT **$6.95**

### OP-AMP Special

BI-FET LF 13741 - Direct pin for pin 741 co… but 500,000 MEG input z, super low 50 pa input curre… power drain.

50 for only $9.00 — 10 for $2.00

SOLD OUT

### Regulators

| | | | |
|---|---|---|---|
| 78MG | $1.25 | 7812 | $1.00 |
| 79MG | $1.25 | 7815 | $1.00 |
| 723 | $.50 | 7905 | $1.25 |
| 309K | $1.15 | 7912 | $1.25 |
| 7805 | $1.00 | 7915 | $1.25 |

### Shrink Tubing Nubs

Nice precut pces of shrink size 1" x ¼" shrink to ½". Great for splices. **50/$1.00**

### Mini TO-92 Heat Sinks

Thermalloy Brand **5 for $1.00**
To-220 Heat Sinks **3 for $1.00**

Opto Isolators - 4N28 type **$.50 ea.**
Opto Reflectors - Photo diode + LED **$1.00 ea.**

### Molex Pins

Molex already precut in length of 7. Perfect for 14 pin sockets. **20 strips for $1.00**

### CDS Photocells

Resistance varies with light, 250 ohms to over 3 meg **3 for $1.00**

# The HAM SHACK

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Evansville, IN 47711
812-422-0231
812-422-0252

MasterCard VISA

*Prices and Availability Subject to Change*

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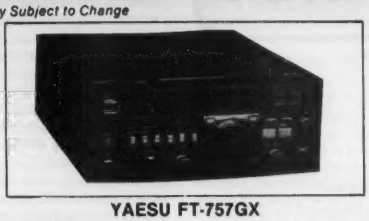
**SANTEC ST 142**

**AEA**
CP-1/C-64 or VIC-20 Software Package.....Call
MP-20 or MP-64 Interface Package.....$129.00
AMT-1 Amtor/RTTY/CW.....449.00
**ALLIANCE**
HD73 (10.7 sq. ft.) Rotator.....$99.00
U110 Small Elevation Rotator.....49.00
**AMERITRON**
AL-80 QSK Amp.....$599.00
**ASTRON**
RS7A 5-7 Amp Power Supply.....$49.00
RS10A 7.5-10 Amp Power Supply.....59.00
RS12A 9-12 Amp Power Supply.....69.00
RS20A 16-20 Amp Power Supply.....89.00
RS20M 16-20 Amp w/meter.....109.00
RS35A 25-35 Amp.....135.00
RS35M 25-35 Amp w/meter.....149.00
RS50A 37-50 Amp.....199.00
RS50M 37-50 Amp w/meter.....225.00
**AZDEN**
PCS4000 2M mobile rig.....$280.00
**BENCHER**
BY-1 Paddle/BY-2 Chrome.....$39.00/49.00



**YAESU FT-757GX**

**BUTTERNUT**
HF6V 80-10 Meter Vertical.....$119.00
**CONNECT SYSTEMS**
Private Patch II.....$425.00
**CUSHCRAFT**
A3 Tribander 3EL.....$215.00
A4 Tribander 4EL.....279.00
214B/214FB Boomers 14EL 2M.....75.00 each
32-19 Super Boomer 19EL 2M.....89.00
**DAIWA**
CN-520 1.8-60 MHz SWR/Pwr Mtr.....$63.00
CN-620B 1.8-150 MHz SWR/Pwr Mtr.....110.00
CN630 140-450 MHz SWR/Pwr Mtr.....129.00
CN720B 1.8-150 MHz SWR/Pwr Mtr.....150.00
**ENCOMM (SANTEC)**
**ST-142, 222, 442, Also Stocking KDK FM-2033**
**The Handhelds Still Offering the Most Features**
**Call for Your Discount Price**
**HAL**
CRI 200 Computer Interface.....$270.00
CRI 100 Computer Interface.....225.00
**HY-GAIN**
TH7 DXS 7EL Tribander.....$439.00
TH5 MK2S 5EL Tribander.....389.00
Explorer 14 Tribander.....279.00
CD45 8.5 sq. ft. Rotator.....129.00
Ham IV 15 sq. ft. Rotator.....199.00
T2X 20 sq. ft. Rotator.....249.00
**Free Shipping on all Crank-up Towers**
**ICOM**
IC-02AT Now Available.....$315.00
27A New Ultra-Small 2M.....335.00
271H 100W All Mode.....Call
471A Deluxe Base Xcvr.....Call
751 Ultimate Transceiver.....1200.00

**ICOM IC-27A**

25H With Free Memory Backup.....Call
745 Amazing Transceiver.....$869.00
IC-2AT.....$215.00
3AT/4AT Handhelds.....235.00
45A 440MHz.....335.00
R71A New & Improved Receiver.....Call
**KLM**
Oscar Antennas in Stock. Call for Prices.
**KANTRONICS**
**The Interface II. The brand new computer interface for CW, RTTY, ASCII. Software Available for VIC20, C-64, APPLE, ATARI, TR80C, TI99**
**Amtor Software Now Available**
**KEN-PRO**
KR-500 Elevation Rotator.....$179.00
**LARSEN**
NLA-150-MM5/8 Wave 2M Mag Mt.....$39.00
**MFJ**
1228 New Computer Interface w/AMTOR.....Call
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313 VHF Conv for HT.....$36.00
**Very Large Stock of MFJ Products. Call for Discount Pricing.**
**MIRAGE**
D24N 440 MHz Amp.....$179.00
D1010N 440 MHz Amp.....279.00
B1016 10-160 Amp/Preamp.....245.00
B3016 30-160 Amp/Preamp.....199.00
**SHURE**
444D Desk Mic.....$55.00
**TEN-TEC**
The fantastic Corsair.....$1020.00
2510 Oscar Transverter.....425.00
2591 2M Handheld.....Available
**TOKYO HY-POWER**
HL 160V 3 or 10/160W Preamp.....$295.00
HL 160V 25/160W Preamp.....269.00
HL90U 10/80W UHF Amp/Preamp.....305.00
HL82V 10/80W Preamp.....139.00
HL45U 10/45W UHF Amp/Preamp.....175.00
**YAESU**
FT-980 Computer Aided Xcvr System.....$1289.00
FT-757GX Super Buy.....740.00
FT-208R 2M Handheld.....265.00
FT-726R Triband Xcvr.....Call
FT-203R New H.T.....Call

## USED EQUIPMENT

**This list was compiled 2/8/84. Our used equipment changes daily. Please write or call for our current listing.**

MasterCard VISA

**AEA**
MBA-RO READER. . . . . $149.00
**ARDEN**
PCS 3000 2M. . . . . $215.00
PCS 2800 10M . . . . . 175.00
PCS 300 H.T. . . . . 209.00
PCS 300/TONE . . . . . 225.00
**DENTRON**
MLA 2500 AMP . . . . . $549.00
W2 WATTMTR . . . . . 49.00
**DRAKE**
TR7/PS7 . . . . . $875.00
R7A RCVR . . . . . 1,025.00
TR4, RV4, AC . . . . . 349.00
TR6, RV6, AC4 . . . . . 469.00
**ECOMM**
ST7T 440Mhz . . . . . .$169.00

**HAL**
CT2200, KB2100 . . . . . 700.00
**HEATHKIT**
SB104A, CW, PS, Spkr . . . $399.00
SB634 Console . . . . . 100.00
SB102, PS, CW . . . . . 325.00
SB101, PS, CW . . . . . 225.00
HW101, PS, CW . . . . . 289.00
HW101, PS . . . . . 250.00
SB620 Console . . . . . 69.00
SA2060, 2KW Tuner. . . . . 189.00
SA2040, 2KW Tuner . . . . . 139.00
HW2036 2M . . . . . 100.00
HP1144 20A P.S. . . . . 69.00
PS9000 DeLuxe P.S.
Spkr & Dual Clocks . . . . 169.00
**ICOM**
751 DeLuxe Xcvr . . . . . .$1,050.00
720A, CW, AM . . . . . 725.00
PS-15 . . . . . 99.00
740 Xcvr . . . . . 669.00
740, CW . . . . . 699.00
251A All Mode. . . . . 399.00
AG-1 UHF Pre Amp . . . . . 59.00
RM-2 Remote . . . . . 69.00
25A 2M Red . . . . . 225.00
245 MTR . . . . . 169.00
SM-5 Desk Mic. . . . . 29.00
SM-2 Desk Mic. . . . . 29.00
HM-8 T.T. Mic. . . . . 40.00

**KANTRONICS**
THE INTERFACE . . . . . $ 79.00
HAMSOFT TR80-C . . . . . 45.00
FIELDDAY READER . . . . . 99.00
**KENWOOD**
TS 830S, CW . . . . . $675.00
TS 820S . . . . . 539.00
TS 820 . . . . . 489.00
VFO-820 . . . . . 115.00
TS 120S . . . . . 379.00
PS-30 . . . . . 99.00
T599D/R599D . . . . . 450.00
W/Filter
AT 130 Tuner. . . . . 95.00
7200 2M . . . . . 89.00
PS-5 w/Timer . . . . . 29.00
RM 76 Remote. . . . . 50.00
BC-5 DC Chgr . . . . . 25.00
PC-1 Phone Patch . . . . . 29.00
YG 455C 500Hz (830) . . . . . 65.00

**MFJ**
496 Super Keyboard/Rtty . . . $199.00
1224 Interface . . . . . 70.00
721 SSB/CW Filter . . . . . 40.00
CWF-2 Filter . . . . . 25.00
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# 73 INTERNATIONAL

*from page 78*

major language spoken, but did you know that besides Spanish over 100 dialects also are spoken? Almost all of them have nothing to do with the Spanish language and have been spoken for thousands of years. You may just get a chance to hear one spoken on two meters sometime when you're down our way! *Hasta la vista* for now!

## MONTSERRAT

*Errol "Bobbie" Martin VP2MO*
*PO Box 113*
*Plymouth*
*Montserrat*
*British West Indies*

### STAR-GAZING TOWARD MARS

The Montserrat Amateur Radio Society (MARS) was founded in 1978 by a small handful of amateurs here on the British Caribbean island of Montserrat, West Indies. It all started when the amateurs decided to pool their efforts in publicizing amateur-radio activities here. The first meeting took place at Foxes Bay at the home of Arnold VP2MH and his beautiful wife Arleen VP2MI. Gathered there were: Arnold Gauthier VP2MH, Charles "Chod" Harris VP2ML, Dr. Konrad Hollatz VP2MF, and Errol "Bobbie" Martin VP2MO.

The first order of business was to elect officers, and this took only a few moments, for the decisions were unanimous. The results were: President—Chod VP2ML, Vice-President—Bobbie VP2MO, Secretary/Treasurer—Arnold VP2MH, and Executive Member—Doc VP2MF.

The total membership immediately rose to 8 when the XYLs decided that they were not going to be left out: Arleen Gauthier VP2MI, Ilse Hollatz VP2MD, Mae Martin VP2MN, and Jean Harris who was not then a licensed ham. Thus began the Montserrat Amateur Radio Society.

Looking at the Society as it is today, it's somewhat difficult for the unknowing to imagine the humble beginnings it had. The first project was introducing amateur-radio classes locally and exposing the general public to amateur radio. This was done in the form of demonstrations, newspaper articles, etc. We immediately applied for and were granted affiliation with the IARU and the ARRL, and Montserrat really came alive on the bands with our operators making world-class scores in the contests and in the pileups.

As we know it today, MARS, with its special callsign, VP2M, is still very active and instrumental in promoting amateur radio nationally and internationally. It is proud of its membership of about 50, divided into three categories: full membership, which entitles one to vote and be eligible to hold office, associate membership A, which entitles the holder to vote but not to hold office, and associate membership B, which is for anyone not a licensed operator but who has an interest in amateur radio, for which there is no age limit.

The Society still has among its priorities amateur-radio training programs, at the end of which there is an exam based upon knowledge of the theoretical aspects of electronics and amateur radio and the capability to receive and send 12 words per minute in Morse code. Through this system there have been a number of new hams on the air.

The present officers of the Society are: Dr. Vernon Buffonge VP2MV, President, a former student of the Society, Sydney St. C. Meade VP2MC, Vice-President, Ursula Sadler VP2MDY, Secretary/Treasurer, also a past student, Victor James VP2MQ, Equipment Officer, also a past student. Executive Members are Dr. Konrad Hollatz VP2MF, Errol "Bobbie" Martin VP2MO, and Perry Britain VP2MR.

The Society's equipment (for its club station) includes an Icom 730, an IC-22, antennas for 2, 10, 15, 20, 40, and 80 meters, a Spectrum SCR-1000 repeater, and a Phelps-Dodge 22' vertical antenna. The repeater is housed in the receiving-station building of the Antilles Radio Corporation, under their auspices, and the antenna is mounted on a 36' pole donated and installed by our local power company, MONLEC. All this is located atop St. George's Hill which rises 1100 feet above sea level overlooking Plymouth and is readily accessible by hams on the neighboring islands.

The repeater and associated equipment were obtained through the perseverance of a few local hams assisted by the influence and integrity of our governor, Sir David Dale, as a gift from Canadian International Development Aid (CIDA) for the purpose of providing communications island-wide in times of emergencies. It is an open repeater except when it is being used for its primary purpose. The frequency is 146.37/.97.

The original surveys as to the effectiveness of 2-meter communications island-wide were carried out many years ago by Alex Kasevich VP2MM and Bobbie Martin VP2MO using an FMH hand-held and a Drake TR-22C portable, and it was discovered that due to the volcanic structure of the islands, 2 meters proved very effective due to the number of reflections we were obtaining; this meant that with a transmitting station located atop any high point, communications could be maintained on a continuous basis.

The Montserrat Amateur Radio Society has formed an Emergency/Disaster Team composed of at least 12 operators resident at various parts of the island who are always ready to go into action if required, and there is a daily preparedness net held via the repeater at 2230Z each evening. The net controllers are on a weekly rotational basis to give each the opportunity and training necessary to handle traffic. Each person has been issued an Icom IC-2 hand-held, spare batteries, converters, and other accessories to facilitate efficiency. Along with this daily exercise, there are regular island-wide simulated-emergency tests involving the entire membership.

Because of the valuable service that the Society has been rendering, the local government has awarded it import-duty-free concessions. These are limited to the members only, so visitors to the island are expected to pay the regular *refundable* deposit required by the system here. This deposit is based upon the value of the equipment that the individual is bringing in.

### LICENSING AND OPERATING REQUIREMENTS

The island of Montserrat (which is 39-1/2 square miles and is a British colony) has reciprocal-licensing agreements (no third-party traffic) with many countries including the USA and Canada, and the following can prove very helpful to persons wishing to operate here. To obtain permission to operate on VP2M, one should (a) send a letter of application stating your estimated time of arrival, (b) the intended length of stay, (c) intended address while here, and (d) type of operation intended; include (e) a copy of your *national* license, (f) a request for acknowledgement of receipt, and (g) a bank draft or certified check in the amount of US$7.00 and an SAE with funds for return postage (no SASEs as foreign stamps cannot be used here).

Send to The Telecommunications Officer, Ministry of Communications and Works, General Turning Road, Plymouth, Montserrat, British West Indies. Please make your application at least 2 months prior to your intended time of arrival in order to allow enough time for processing and mailing.

### LICENSE JURISDICTION BOUNDARIES

Irrespective of the shady practices very evident today in some areas and the apparent disregard of what agreements really mean, under the reciprocal agreement obtaining a VP2M callsign does not in fact give one the right to export the call. In other words, the callsign issued by reciprocal agreement is *not valid outside of the host country.* If used under those circumstances, it is illegal and is subject to reprisals just the same as when any other law of a country is broken. In fact, a person who obtains permission to operate here is protected only as long as he is in the jurisdiction of this country; as such, he is subject to the laws governing Montserrat and by the same standards is not allowed to operate within this territory until such time as permission is applied for and obtained.

In the case of maritime mobiles, etc., those stations can operate while in international waters using their original calls/MM2, but just as soon as one enters territorial waters, one has to QRT the station until permission is granted (unless he has had prior permission). This topic has been the subject of much misunderstanding in the past, and hopefully this practice will cease to exist. If one is not aware of the requirements, one only has to ask around, for ignorance of the law is no excuse!

This misunderstanding, sometimes deliberate, has led many administrations to change their licensing system, reverting to portable calls or slash suffixes in a move to thwart these offenders, and as a result, much inconvenience has been caused to genuine DXers and contesters alike, and the objective is to stop issuing something that can be exported.

It's a real shame if it results thus, but we only have ourselves to blame.

*The VP2MO antenna farm. (Photo by VE5RA)*

## THE NETHERLANDS

*Henk Meerman, Jr. PD0DDV*
*Zandvoorterweg 33*
*2111 GR Aerdenhout*
*The Netherlands*

### TOP SCORE FROM DUTCH SWL

Dutch SWL Jan Steenbergen NL-213 has a top score on VHF and UHF. On two meters, Jan received the incredible number of 60 different countries, 58 of them confirmed. His best catch on two was Z56DN via transequatorial propagation. On 70 centimeters, Jan heard 35 countries and got 32 confirmations. Jan's best catch on UHF was JA9BOH with Earth-moon-Earth reception.

### ATV RELAY

In the region of Doetichem, a few hard-

working amateurs are trying to construct an amateur television relay station. When this station is ready, they will place it near the village of Aalten in the eastern part of the Netherlands. Plans are to have FM input on 1275 MHz and an AM-CCIR output on 1252.5 MHz.

### P14YK

P14YK is the call of a brand-new station that will be on the air for standard-frequencies broadcasts for the benefit of Dutch amateurs. The station also will broadcast RTTY standard test tones for alignment purposes with a very stable frequency. Furthermore, the station will be able to measure the deviation of signals received from counterpart stations in the two-meter band. Frequencies that will be used by P14YK are 3600 kHz, 144.800 MHz, and 432.800 MHz. The station will be on the air on the following dates this year: January 11, March 14, May 9, July 11, September 12, and the 14th of November. Transmission starts at 1900 UTC. The first operator of P14YK will be Piet van Weerlee PA0YZ.

### THE FIRAC

About twenty years ago, those railroadmen who had ham radio as their hobby were united in the international union, La Federation Internationale des Radio-Amateur-Cheminots (the FIRAC). On the first of November of last year, the RANS (Radio Amateurs Nederlandse Spoorwegen), the Dutch division of the FIRAC, was begun. The purpose of the RANS is to strengthen national and international contacts between railway employees. At this moment, the local union has about 30 members.

## NEW ZEALAND

*D. J. (Des) Chapman ZL2VR*
*459 Kennedy Road*
*Napier*
*New Zealand*

The space-shuttle flight of W5LFL was not very successful for ZL amateurs, as reported in last month's column. The reasons were no doubt attributable to the late launching of the shuttle, changed work schedules, rest times, and the space vehicle's 2m antenna not facing Earthwards when over our area.

Interested amateurs here were able to obtain orbit information, times, and frequencies for contacts with W5LFL through the ZL 80-meter AMSAT net on 3850 kHz nightly (the net was especially activated for information dissemination), ZL1MO doing a fine job in this direction. Other amateurs made trans-Pacific telephone calls to NASA to get updated orbital data. But all this was in vain because no ZL stations heard Owen transmitting, although many ZL stations tried transmitting on the various uplink frequencies without hearing W5LFL calling first. However, it could be that he copied some of these stations; we shall just have to wait for the list of confirmed QSOs, with interest.

Amateur satellites are an area of growing interest in ZL. We are fortunate to have Ian Ashley ZL1ADX as one of the AMSAT-appointed ground-command stations for the Phase III series of craft. Ian is always ready and willing to provide assistance and information to those who are interested in this facet of the hobby. As the Technician-class license in New Zealand is presently a non-Morse grade, some ZL VHFers in this grade are restricted in their satellite work; they are prevented from the use of Morse as a means of communicating through the various amateur satellites. As a consequence, the Phase-II-type satellites with their 2m uplink and 10m downlink frequencies are still very popular. The Russian RS-series satellites are proving very reliable in this respect.

OSCAR 10 is more of an obstacle as stations require a reasonable UHF SSB signal to access this craft, and this usually means the purchase of a 70-cm multimode rig or a transverter for the HF rig. Nevertheless, an ever-increasing number of amateurs in ZL are equipping themselves for operating through this bird. The tremendous DX capability offered by OSCAR 10 is a powerful incentive—from ZL locations, places as far away as Israel, Kenya, and Helsinki are just in range at various tmes during the orbit, and the ability to make contact with west-coast USA stations most of the time is also a real bonus.

The special-service channels on OSCAR 10 have so far seen little utilization "down under." Suggestions have been made to use one of these to distribute an IARU Region 3 bulletin with scope for local news inserts. This is already being done in Region 1 and seems to be working very well. Information on STS-9 was broadcast from OSCAR 10 and provided a welcome source of times when HF propagation was poor. Hopefully, some use of these special-service channels will be realized in 1984.

At a later date I will try to bring a report on the summer VHF/UHF DX season and the annual VHF/UHF Field Day activities (in February).

Field Day in ZL originated in the early 1930s as a means of testing the effectiveness of the newly-set-up ZL Amateur Emergency Corps, when most active branches went into the field with portable transmitters and receivers operated from dry batteries and stations exchanged messages up and down the length of ZL.

There is still an Amateur Radio Emergency Field Day each year to test the emergency communications network, but the real Field Day activity is the National Field Day in February, when branches of NZART set up stations in a field situation, operate from some form of portable power, and participate in a contest to find the top teams in each ZL district and overall winners for the whole country.

There are trophies for QRP, single operator only, CW only, etc., and last year 60 of the total of 79 branches were activated in the contest. The National Field Day preparations begin with the selection of suitable sites, and these vary from somewhere within city limits to isolated situations away from cities and towns. Once the sites have been selected, the next step is to organize the antennas to be used and prepare them in a knock-down state for quick and easy setting up on the morning of Field Day.

One of the rules governing this activity is that no part of the station may be erected before 10 am on the morning of Field Day, in preparation for the commencement of the first operating session at 1500 hours the same day.

So, once the antennas have been arranged, then the FD controller recruits operators, rigs, the portable power supply, and tents or other portable accommodations for the station and the operators who have to camp out overnight, and arranges a meeting to coordinate all these details. The operators who are manning the station have to attend to their personal requirements for food and sleeping if they are in the overnight group. There are usually a number of operators who attend for their operating periods and return home for overnight.

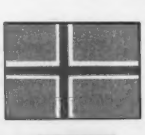
The contest operating periods are from 1500 to 2400 hours Saturday and from 0600 to 1500 Sunday. During that time, stations operate on 80 and 40 meters, phone and CW, under the usual contest setup, exchanging number groups for each contest. The operating periods are on an hourly basis, only one contact for each mode being permissible between stations each hour. The usual arrangement followed by most stations is phone for the first half hour and CW for the second half hour, throughout the contest. Location and propagation as well as operating skills play a big part in each group's activities, but come what may, most branch groups have a ball on Field Day.

There are always many humorous stories told at subsequent branch meetings about the various activities of the participants both on the air and during their rest periods. And also there are the hard-luck tales when rig failures, antenna problems, propagation, etc., robbed a team of their chances in the contest. But regardless of these problems, the really keen ones are always to the fore when the names are being collected for Field Day operators each year because it gives members a chance to get together in a picnic atmosphere, compete against the other branches of NZART, and enjoy themselves in a friendly competitive environment with plenty of time for operating and eyeball rag-chewing between operating periods with other members of the team and visitors to the site. Of course, there is also the consumption of numerous 807s, TU1s, or whatever your special name might be for the proverbial bottle of beer, as February in ZL is the equivalent of July/August in the Northern Hemisphere; it is plenty hot and good mosquito weather usually, just the setting for camping out and increasing the liquid intake.

### BITS 'N' PIECES

A recent visitor to ZL-land was W6REC/ZL0AJW (Duane Asherman) who has been hitchhiking throughout both main islands, meeting amateurs he has worked and talking to interested groups on the artificial heart project he was associated with several years ago in the States. Duane also is meeting with vintage motorcycle groups, too, as that is another of the interests he has.

While in our area, Duane attended a special meeting of the local branch and gave us a talk on the development of the artificial heart with the team he was involved with in Cleveland, Ohio, some years ago. The talk was received with great interest, and from the questions put to Duane, the members present were appreciative of his giving us the chance to hear his talk and meet him, even though just briefly. No doubt many of those he met made arrangements for QSOs when he returns home to California.



## NORWAY

*Bjorn-Hugo Ark LA5YJ*
*3120 Andebu*
*Norway*

Welcome to a new year, and we are just getting used to writing 1984. DX activity has from my side been rather low, but we have managed to work VU7WCY, Laccadives, on several occasions. Unfortunately, this was not a new one, but we got him easily on 40m CW. Operation sounded very smooth and easy although the conditions and the signal were mediocre; the operation went rather easily on both expeditions. I reckon quite a few DXers spent some nice moments working him.

There is one thing that always surprises me: Even the average operator turns out to be a rather experienced operator after a while. The only difference between him and the very experienced operator is the speed and the stubbornness to keep on giving those 59 reports even if he is so tired that he is falling asleep between the QSOs. Others who seem to chat a lot about how great they are but haven't yet proved it in a contest seem to fall apart when placed under those stressful conditions. It is difficult to judge who will be a better operator, but it seems to me that the average serious DXer could do the job perfectly even if a little slowly in the beginning. It's just a matter of will and understanding.

Even if I haven't worked too many DX stations on the lower bands, I have spent some time monitoring 160, 80, and 40 meters and have on several occasions had the pleasure of hearing stations all over the world come through on 160. 80 has been as usual quite good, but not the big burst I have been used to. Other LAs have of course had some nice openings, but it's a matter of being at the right place at the right time. Since I have only the weekends to spend, the QRM level always rises quite a bit then, and one surely gets fed up with hearing those multi-kW guys with big antennas laying two or three kHz away from each other sitting there calling CQ DX hour after hour. Surely they are working some stations, but I'm sure they could have worked quite a few more with a little bit more listening. Very often a local W QSO is taking place on the same frequency, and as a result nothing transpires. You could, of course, go into the same business, but since your signal is not that spacy, they creep up on you, and I sincerely can imagine quite a few more pleasant things to do than messing around on a crowded 80-meter DX portion.

40 meters as always is great—signals pushing through from all areas, and if you have the possibility, get up a sloper, dipole, or inverted V and see for yourself what kind of result you may obtain. It's really amazing how good that band is.

Guess what I've done? I've computerized. Just purchased a CBM-64 and am starting to get familiar with the common Basic language. Looking into back issues of *73* for programs, but all the programs I seem to have use for are made for the TRS-80 or the ABC-80. Why couldn't someone have put in more programs for CBM-64 computers? I'm sure both the editors and the readers would like that very much.

The CBM-64 seems to have taken more of the market among radio amateurs in Norway. I'm really looking forward to a program taking care of my log books, band/mode, countries, and my 5-band WAS, with easy access to the information. The CBM-64 should have the capacity to handle this kind of stuff very easily.

I must say that this computer seems to make me feel more or less the same way I felt when presented with my first amateur station. For some funny reason, I did learn that quite easily though, so even if a few years have been added since then, I reckon I should be able to manage this new challenge as well.

The LA-DX group had, during January, another successful meeting in Oslo. This time they had made arrangements to include a visit of SM0AGD. Eric gave his famous speech based on his DX trip

around the Pacific Ocean. He presented his adventure in a very interesting manner. It was a great pleasure to meet him for the very first time. It is rather rare for us in Norway to be able to greet such accomplished hams on the DX front.

Eric himself used the opportunity to collect members for the NCDXA, and I sincerely hope that they will appreciate his efforts in California.

This session was really quite an unforgettable one, and again, thanks to Eric for taking the time to visit us and to the LA-DX group for the arrangement. It is absolutely recommended that you invite Eric SM8AGD if you wish to have a successful meeting.

We have just heard that several of the guys here in LA-land have been able to work ZL8AFH on Kermadec Island and that he is active even on 40 meters. Surely I can tell what my weekends will be occupied with until I land that new one for me. Actually, we sincerely hoped that Jim VK9NS would be able to go there, but it seems that this has been cancelled for the time being, so we had better concentrate on working the guy who's there.

As you probably know already, Clipperton is due and we are hoping that we'll be able to land it this time; after what I've heard, quite a few others are having the same hope.

I wish you good luck in your achievements both in DXing on the lower bands and in getting a new one.

## POLAND

*Jerzy Szymczak*
*78-200 Bialogard*
*Buczka 2/3*
*Poland*

### JUBILEE RADIOLOCATION CONTEST

The 10th Jubilee Radiolocation Contest organized in connection with the 40th anniversary of the birth of the Polish Peoples Army took place in Funka (Bydgoszcz province) in August, 1983. The Commander of the Pomeranian Military District, General Zbigniew Blechman, was an honored guest.

A higher technical standard was achieved in the 10th contest than in the 1st one, when referees shrouded in thickets had to become visible to do their judging. This time, a photodetector coupled with a crystal clock (the work of two designers from Bydgoszcz, S. Wilczynski SP2FLE and A. Owslanny SP2GJI) made it possible to gauge the time of competitors.

Eighty-one men and women competed from 13 district departments of PRAA (Polish Radio Amateurs Association), one contestant came from GFR, and one from GDR partook of the contest. On August 25th, the competition took place on the 3.5-MHz band. The terrain was broken up by hills and woods and was rather difficult. The length of the route for men was 5.5 km. Among 72 starting contestants, 28 did not end the race or went beyond the limit of time. The best men competitors found 5 or 4 senders in about 1 hour and the best women did the same in about 1 hour 43 minutes.

The competitions on 144 MHz were carried out on August 26th. The length of the route was 4.5 km. Also 81 took part this time. The times of the best competitors were from 36 to 51 minutes according to category.

By virtue of scores in both competitions, the best teams were the team of DD of PRAA, Bydgoszcz: Champion of Poland; the team of DD of PRAA, Lomza: Vice-Champion of Poland; and the team of DD of PRAA, Biala Podlaska: Second Vice-Champion of Poland.

Congratulations!

#### JUBILEE RADIOLOCATION WINNERS
(Champions and Runners-Up)

| Individual | PRAA District |
|---|---|
| **3.5-MHz Band** | |
| ***Men*** | |
| 1. Jerzy Wos | Bydgoszcz |
| 2. Jaroslaw Palubicki | Lomza |
| 3. Berndt Jurgens GFR | Leszno |
| ***Women*** | |
| 1. Gabriela Banach | Bydgoszcz |
| 2. Agnieszka Gizelska | Konin |
| 3. Olga Prokowska | Szczecin |
| ***Juniors*** | |
| 1. Slawomir Kaszubowski | Bydogoszcz |
| 2. Jaroslaw Jaswinski | Lomza |
| 3. Dariusz Besaraba | Poznan |
| ***Teenagers*** | |
| 1. Jerzy Nicpon | Bydogoszcz |
| 2. Dariusz Skiba | Leszno |
| 3. Slawomir Fac | Lomza |
| **144-MHz Band** | |
| ***Men*** | |
| 1. Jerzy Wos | Konin |
| 2. Zenon Kuciak | Leszno |
| 3. Telesinski Jerzy | Szczecin |
| ***Women*** | |
| 1. Mariola Grebosz | Bydogoszcz |
| 2. Olga Prokowska | Szczecin |
| 3. Barbara Patoka | Ostroleka |
| ***Juniors*** | |
| 1. Slawomir Kaszubowski | Bydogozcz |
| 2. Marek Harasimowicz | Szczecin |
| 3. Kazimierz Kraszewski | Lomza |
| ***Teenagers*** | |
| 1. Pawel Smyk | Bydgoszcz |
| 2. Jerzy Nicpon | Ostroleka |
| 3. Dariusz Skiba | Konin |

## REPUBLIC OF SOUTH AFRICA

*Bill ZS6XD, Chairman*
*Southern Africa DX Association*
*PO Box 48670*
*Roosevelt Park 2129*
*Republic of South Africa*

### NEWSLETTER, WEEK ENDING 1ST FEBRUARY 1984

One month into the DX year and the bands have been buzzing with activity despite poor band propagation on 10 and 15 meters. Predictions for the next 12 months vary from fair to poor as we slide further down into the low end of the 11-year cycle (which has still another two years to go before bottoming out!). 20 meters, however, should provide some very good openings and will be the DXer's band for many of those rare contacts.

Table 1 provides contact information from Eric ZS6ME which gives an indication of the band conditions. It is expected that the 40m and 80m bands will become more popular as 10 and 15 meters deteriorate.

XT2BR (Upper Volta) has been very active on 20 meters and can be heard most nights in a stateside pileup at 2100 UTC. Even from the back of his beam he can hear us! Also current and active for the next 4 weeks is OM Patrice 5T5RY in Mauritania. OM John CT2FR will be active from the Azores up until 1985. Look for him on 20m at ± 2100 UTC.

### WHAT IS SADXA?

SADXA was formed in June, 1983, by a group of South African DX operators with the aim of assisting DXers and newcomers to DX with information regarding DX operations and techniques. The founder of SADXA was the late Mike Sherman ZS6IW, who put forward the idea of a number of prominent South African DXers. Other founder members are Bob Hooper ZS6AEV, Bill Smith ZS6XD/H5AHF, Sam Ford ZS6BRZ, Eric Meyer ZS6ME, and Julius Lieberman ZS6AF/4Z4NY.

The aims of SADXA are many, but among them is the aim of improving amateur activity on the African continent by assisting newcomers to the hobby in countries where equipment cannot be obtained or, if available, is exorbitantly priced, by donating equipment, QSL cards, etc., and offering assistance, where possible, with the setting up of new stations.

DXpeditions are also a major part of the SADXA operations, and the general aim is to have at least one a year. Likely locations are Bouvet Island (3Y), Malawi (7Q), Botswana (A22), Heard Island (VK), and Marion Island (ZS2MI).

To its members, SADXA will provide, in the form of a monthly newsletter, the latest news of DX operations and DXpeditions worldwide, times, dates, and frequencies of operation of rare countries and stations, news of forthcoming events, and general information and news regarding DXing, i.e., QSL info, propagation predictions, etc.

SADXA will also, in the not-too-distant future, conduct an HF net on one of the bands. Details about that will be published in the newsletter. At the moment, a DX Alerting Net is operational on 144.975 MHz in the Witwatersrand area, and we hope to expand that to a 40m net as well.

Also in the pipeline is an "Africa Calling..." DX contest in which the aim will be to contact as many stations on the continent of Africa and in the Indian Ocean area as possible during a 24-hour period. An annual trophy, the Mike Sherman Memorial Trophy, will also be instituted and will be awarded to the ham that, in the judgment of the SADXA committee, has done the most for the DXing aspect of our hobby in that year.

As can be seen, SADXA is an organization worth belonging to, and without members to support us, we cannot grow or do what we would like to do. Interested? Write us for application forms!

| | | | | |
|---|---|---|---|---|
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| EA2DY | Spain | 21 | MHz | 1920 |
| HI3PC | Dominican Republic | 14 | MHz | 2100 |
| GJ2LU | Jersey Island | 28 | MHz | 1002 |
| YB4FN | Indonesia | 28 | MHz | 1100 |
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| A4XRS | Oman | 7.074 | | 1834 |
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| 4S7PVR | Sri Lanka | 14.272 | | 1653 |

*Table 1.*

## SWEDEN

*Nils-Gustav Strom SM5EEP*
*Kampavagen 1*
*S-773 00 Fagersta*
*Sweden*

### THE "CHEAP TRICK" TVRO NOW ALSO IN SWEDEN

In my part of the world TVRO equipment is still not very common. *QTC*, the Swedish ham magazine, has not yet published any material about satellite TV, but as a subscriber to *73* magazine during 1982, I devoured articles about satellite TV. I decided with help from these articles to build Dwight Rexroad's "Cheap Trick" (*73*, September, 1982: "The $100 TVRO Receiver," Stephen Gibson) and bring down the Russian TV satellite (4 GHz) Ghorizont, which has 3 transponders. Transponder No. 1 is available in Sweden.

I succeeded with the Cheap Trick and can now watch Russian television. I do not care much for the East Block propaganda, but I do recommend the children's (circus and sport) programs. Before telling you about the hardships with the Cheap Trick, I would like to tell you a little about myself.

My profession is associated with electrical power equipment (motors, generators, transformers, etc.). When I was in school, the transistor was not mentioned in the books! I have always been interested in pictures, but I am a lousy photographer.

On my own, I have tried my best to follow modern technology. My first project was to build a small black-and-white TV set equipped with VHF, UHF, and video input and output. This television set has later been very useful in other projects. As an old man (or at least well over forty), I got my ham certificate in 1971.

However, I wanted to do something other than operate in voice and code via my station. One by one, I have done projects for gear which no other Swedish hams have! This has meant that I have not been able to discuss them with anyone. The projects have been relatively difficult. They always had their origin in the United States. The projects were:

- 1975: SSTV monitor and flying spot scanner (W9NTP), the only one in Sweden!
- 1978: SSTV keyboard (W6LMD), the only one in Sweden!
- 1983: TVRO, Cheap Trick (Rexroad), the only one in Sweden for the present.

As you can see, I have SSTV very much at heart and I am now on the air, color SSTV, in the 24-sec. mode.

For the Cheap Trick project, Rexroad suggested a parabolic antenna as well as an LNA. Where to get hold of this equipment in Sweden where only the Russian Ghorizont (with factory-made TVRO equipment) can be seen? However, there are 2 or 3 commercial firms which are getting prepared for the real satellite-TV wave around 1985-1986. Fortunately, these firms happen to have hams on their staffs.

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## DON'S CORNER

Kudo's to Yaesu. Tang, our spy in Japan, heard of the demise of the IC-2 series of portables. . . "Old Faithful" to HT users, Well, Yaesu is introducing a similar design for less money. Bells and whistles are nice, but the plain-jane thumbwheels are still most demanded by experienced users. Way to go Yaesu.

73,
Don

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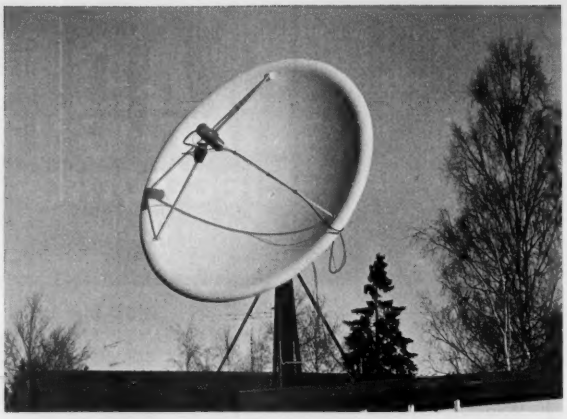
*OM SM5EEP with the Cheap Trick.*



*SM5EEP's antenna.*

*Reception from the Ghorizont. This improved after further aiming of the antenna.*

I managed to get a warped antenna and a laboratory LNA (GaAsFET/NE21889) at a very low price. The LNA took 100 mA which is no guarantee for perfect function! Although I had only 40% of Rex's requirements, I decided to go ahead with the project.

I started to obtain the parts necessary in November, 1982, and in December all the PCBs were etched and equipped according to Rex's instructions. A few parts were imported from the United States. The deliveries always arrived promptly. During the winter the project was suspended, but it came alive again in the summer. The antenna was mounted before the summer holidays. The problems began in the starting-up procedure. How and where should I start the alignment?

There was no TV satellite receiver to borrow in Sweden. Nor did I know any owner of a spectrum analyzer or a sensitive counter. I was nearly desperate, but a certain Mr. Mac Palomaki from one of the commercial firms promised me he'd check my downconverter (MRF901). According to Rex's instructions, we made 3.2 GHz. One element that was OK!

I now moved up to the garage roof to test the antenna, the LNA, and the downconverter, which gave 500–800 MHz corresponding to the UHF channels No. 23–25 in the Swedish TV system. If all details functioned and the signal was fed into a TV set, I should get video sparklies or at the best a very bad picture. I got a bad picture which later was aligned to best quality. I continued my work in the garage where Rex's receiver was to be aligned step by step. The UHF tuner was a problem.

The input was altered according to Rex's instructions, but in the output only R20, C10, and C28 were removed. L18 and C26 were replaced by 1000 pF. Consequently, no broadband transformer. Now I got 70 MHz, but pin 1 was fed with about +1.75 V.

The 70-MHz filter was aligned with an ordinary signal generator with an output of 50 Ohms and a very even output level.

The transformer, T1, caused a lot of trouble in the baseband block. Finally, I found the right connection and the 70-MHz signal could be divided.

The video- and audioblock caused no problems, so I could peacefully watch a perfect black-and-white picture on my homemade TV set. Now I began to align all the circuits starting at the antenna and the LNA. As the RG-59 cable had now been led into my house, the working conditions were now more pleasant!

One last problem to overcome! Ghorizont transmits through the SECAM system while we use the PAL system in Scandinavia. There are, however, now PAL/SECAM TV sets on the market, so of course I got hold of one. By using my VTR, I can now enjoy Ghorizont in color. The quality is 95%, which is very good. The missing 5% is to be found in the warped antenna and the dubious LNA!

Rex, thank you for this project! It took me some time, but I am presumably the only lucky person in Sweden to have experienced this miracle.

## THAILAND

*Radio Amateur Society of Thailand*
*PO Box 2008*
*Bangkok*
*Thailand*

### SECOND GENERAL MEETING, 1983

Mayuree Chotikul HS1YL presided. There was introduction of new members, including foreign guests who were attending the meeting.

The society attended the 13th meeting of SEANET Convention at Singapore. 13 representatives from RAST attended, joining some 200 delegates from other countries. The meeting voted that the 14th SEANET Convention, scheduled for 1984, would be held in Malaysia.

Sombat Tharincharoen HS1BV, treasurer, reported that the grand total remaining was 69,706.75 baht [c. US$3,000].

Hans Hollstein HS1BG, secretary, reported that Victor C. Clark W4KFC, president of the ARRL (American Radio Relay League), died of heart failure on November 25, 1983, and that he was going to send a cable of condolences in the name of RAST to the League.

The Central American country of Belize (for which the prefix is V3) is applying to become a member of IARU World Association and asked for a vote of support from RAST. The meeting unanimously voted to admit the country.

The Asian Institute of Technology (AIT) at Rangsit has given informal permission for RAST to use the site as a place for permanent contest operations.

A total of 161 countries were contacted during the *CQ* WW CW contest on November 26–27 from a station set up at AIT, and Thailand expects to rank about sixth with an estimated 625,000 points.

For future CW contests, a consensus was sought to use the callsign HS0A which is a good call for that mode. The meeting unanimously approved this.

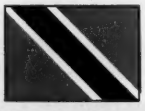
Election of executive committee members for 1984 resulted in the following: president: Chamnong Phiromphakdee HS1WB; first vice president: Mayuree Chotikul HS1YL; second vice president: Prof. John Hugh Jones HS1AIT; secretary general: Hans D. Hollstein HS1BG; deputy secretaries: Chaiyong Wongvudhikamchorn HS1BL and Sombat Tharincharoen HS1BV; treasurer: Rasdaphorn Bunphithak HS1DC; duputy treasurers: Kamol Choosri HS1DG and Yukluechai Pramitithanakan HS1YP; members at large: Chester Davis HS1AIM, Athit Chuenchamnong HS1EK, Sahas Bhukkaman HS1WC, Banchorn Pramitithanakan HS1JK, Thawatchai Suthavanich HS1HT, and Surapong Srivinich HS1NA; bulletin manager: Hans Hollstein HS1BG; deputy QSL manager: Tony Waltham HS1AMH; public relations managers: Tony Waltham HS1AMH and M.R. Chakarin Vorawan HS1VV; registrar: Khun Phachern Singhaphalin HS1DH and Kijja Naksomphop HS1KJ; lawyer: Dr. Gunn Nakhamdee.

### INVITATION TO VISITORS

The Radio Amateur Society of Thailand holds regular monthly meetings which all foreign radio amateurs and SWLs visiting Bangkok are invited to attend.

The club's committee is pleased to inform anyone who may be visiting Thailand during the first Sunday of any month that the society now meets at the Singha Bier Haus on Asoke Road.

An excellent buffet luncheon is provided, and meetings begin at 11:00 am. A feature of the meeting is usually a talk or demonstration relating to amateur radio, as well as the usual informal get-together.



## TRINIDAD AND TOBAGO

*John L. Webster 9Y4JW*
*c/o Department of Soil Science*
*University of the West Indies*
*St. Augustine*
*Trinidad*
*West Indies*

The TTARS welcomed the arrival of 1983, especially due to its designation as World Communications Year and the obvious emphasis that would be placed on communications. The TTARS has always found it difficult to create an awareness in the local public of amateur radio. Trinidad and Tobago, being the most southerly of the Caribbean islands, tend to escape the destruction often wreaked in the more northerly Caribbean islands by the passage of hurricanes.

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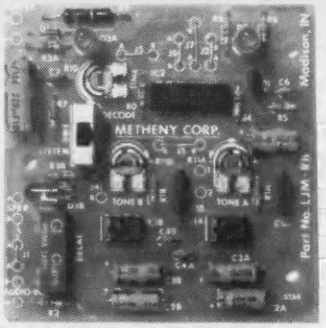


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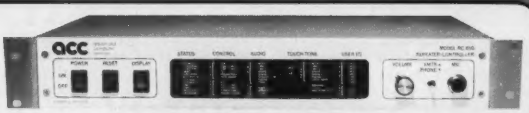


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↙See List of Advertisers on page 114

These hurricanes, although very destructive to homes, property, and agriculture in the Caribbean area, have actually been a benefit to the ham population. The governments in the affected islands have recognized the importance of encouraging amateur-radio operations and have usually extended a variety of privileges to hams, including duty-free concessions on imported amateur-radio gear. This has been very good for the growth of the ham community in this area, where income is often quite limited.

Unfortunately, in Trinidad and Tobago the importance of amateur radio has yet to be appreciated. Many persons either do not understand or do not know about amateur radio, and it is often confused with CB, which is illegal in this country. This confusion has, on occasion, led to the harassment of licensed radio amateurs by the police.

The Executive of the TTARS recognized the benefits that could be derived from WCY and devised a public-awareness and -education program for 1983.

This program took the form of a series of TV interviews with members of the TTARS during which they discussed most aspects of amateur radio, demonstrated ham equipment, and displayed some samples of home-brewed equipment. Throughout the interview series, viewers were encouraged to contact the TTARS, and many did.

There also were radio interviews on the local broadcasting stations, and two of the ARRL films were screened during prime viewing time on the local TV station. The films screened were "The World of Amateur Radio" and the one on Dr. Owen Garriott's planned operation from the space shuttle, *Columbia*. This was quite an achievement for the TTARS, as it was previously almost impossible to get an amateur-radio film screened at all.

The public-awareness program culminated in participation by the TTARS in a large government-sponsored exhibition on communications. This exhibition was held during the last week in October and will be the subject of the second part of this review in my next column.

The TTARS participated in several other events during 1983. The annual simulated-emergency test was conducted in June. Participating stations used only emergency power, and many of the newer hams were introduced to message handling while operating from remote locations.

Our president, Nick Percival 9Y4NP, attended the IARU conference in Cali, Colombia, during the first week of July. At this conference, Nick was the official representative of both the TTARS and the Amateur Radio Society of Barbados (ARSB). Later in the year, in October, he once again represented the TTARS at the World Amateur Radio International Conference (WARIC) in Tokyo, Japan. Here Nick had the rare privilege of being the unofficial representative of an entire continent—there was no one else representing South America!

In the first half of the year, the TTARS and ARSB jointly created history by linking the islands of Trinidad and Barbados on two meters. After several years of planning, the 9Y-8P link repeater was installed and has been operating since with varying degrees of success. Details of this system will be the subject of a future column.

While on the subject of repeaters: The local repeater has for many years operated on 146.34/.94 from a remote site in the central mountain range in Trinidad. It actually shares the location with the repeaters for Amoco (oil company). From early in 1983, the repeater was on the air sporadically and the trouble was traced to lengthy power outages in the area causing the backup battery system to become exhausted. On one occasion, the battery charger was damaged by the power fluctuations. Hams had, therefore, become accustomed to finding .34/.94 not on the air. With the introduction of the link repeater system, they simply switched to that frequency until .34/.94 returned to the air.

In mid-October, .34/.94 once again disappeared from the air. After a week had elapsed and it still had not returned, our technical officer, 9Y4AR, decided to investigate. We were all shocked to learn that the repeater hut had been broken into and our .34/.94 machine, standby battery, and charger had all been stolen! Amoco also lost some of its equipment. Fortunately, our duplexers were left behind, probably because they were firmly bolted down to the floor. Up to the time of writing this column, the items have still not been recovered and the TTARS is making plans to purchase a new repeater in 1984.

Well, until next time, 73 and good DXing.

## VENEZUELA

*Luis E. Suarez OA4KO/YV5*
*PO Box 66994*
*Caracas 1061-A*
*Venezuela*

There are several radio clubs in Venezuela. Most are local clubs with small memberships. The Asociacion de Radioaficionados de Venezuela (ARV) and the Radio Club Venezolano are national organizations with memberships ranging in the thousands.

The ARV was established in Caracas on January 24, 1967. It has 43 Seccionales (branches) in all 9 call areas. At this time there are 7 more Seccionales almost ready to be established. As a demonstration of democracy, the ARV bylaws specify that the board of directors' HQ would be in major cities of the country on a rotational basis. That's because the ARV has a dynamic modern organization based on goodwill and hard work.

The current national board of directors includes the following members: Jose YV5AEX, Francisco YV3ARE, Manuel YV5ETV/3, and Nicanor YV5FVN. The general coordinator is Marichal YV5FTU. This board has been on duty for the past two years. The ninth national convention will take place in Guacara, Carabobo State, next July.

This dynamic association manages the most reliable and trustworthy QSL bureau in YV-land. At this time, in Caracas the bureau is managed by Ramon YV5FAA.

Besides all those normal activities of a radio club, currently the ARV members are carrying out technical seminars and, at this moment, they are arranging an expedition to the widely-known Angel Falls. This, no doubt, is a major event for the year. Nevertheless, the ARV fraternity feels that there will be many important happenings during 1984.

The seminars are organized by coordinator Ramon YV5EED, a young medical doctor, and are scheduled four times a year. The central subject is selected by consensus. The first one was "The Two-Meter Band" in October; the second was "Operational Practices" this January. The third was programmed for April on "Satellites."

### RADIO BULLETINS

YV5ARV, the ARV's station in Caracas, broadcasts a weekly bulletin on 7,100 kHz every Saturday at 1700 UTC. Each official station at each of all 43 Seccionales joins in. I recommend to all DXers that they keep the list of all 43 stations for future reference (see Table 1). The meeting lasts several hours due to the large number of participants (jammers included).

| Name | City | State | Call |
|---|---|---|---|
| *Circuito 1* | | | |
| General Rafael Urdaneta | Maracaibo | Zulia | YV1ARV |
| Catatumbo | Cabimas | Zulia | YV1ARC |
| Loas Motilones Perija | Machiques | Zulia | YV1LMP |
| Jose Leonardo Chirinos | Coro | Falcon | YV1RV |
| Mariscal Juan Crisostomo Falcon | Punto Fijo | Falcon | YV1APF |
| Luis Pena Vazquez | Valera | Trujillo | YV1LPV |
| *Circuito 2* | | | |
| Camilo Prato Fernandez | San Cristobal | Tachira | YV2RV |
| Somos Los Comuneros | San Antonio | Tachira | YV2SLC |
| Cinco Aguilas Blancas | Merida | Merida | YV2CAB |
| Luz del Paramo | Tovar | Merida | YV2LDP |
| Sur del Lago | Ciudad Bolivia | Merida | YV2SDL |
| General Pedro Briceno Mendez | Barinas | Barinas | YV2ARV |
| Alfredo Arbelo Lariba | Barinitas | Barinas | YV2SAL |
| *Circuito 3* | | | |
| General Juan Jacinto Lara | Barquisimeto | Lara | YV3RV |
| Pio Tamayo | El Tocuyo | Lara | YV3ARV |
| Jose Vicente de Unda | Guanare | Portuguesa | YV3JVU |
| General Jose Antonio Paez | Acarigua | Portuguesa | YV3JAP |
| *Circuito 4* | | | |
| Pedro Fonseca Ferguson | Valencia | Carabobo | YV4AK |
| General Jose Felix Ribas | Maracay | Aragua | YV4RV |
| *Circuito 5* | | | |
| Santiago de Leon | Caracas | D.F. | YV5ARV |
| Doctor Jose Maria Vargas | La Guaira | Miranda | YV5JMV |
| Gran Cacique Guaicaipuro | Los Teques | Miranda | YV5GCG |
| Vicente Emilio Sojo | Guarenas | Miranda | YV5VES |
| Guarico | San Juan de los Morros | Guarico | YV5DJR |
| Francisco Lazo marti | Calabozo | Guarico | YV5FLM |
| El Sombrero | El Sombrero | Guarico | YV5SES |
| *Circuito 6* | | | |
| General Pedro Maria Freites | Barcelona | Anzoategui | YV6PMF |
| General Jose Antonio Anzoategui | Puerto La Cruz | Anzoategui | YV6ARV |
| Cacique Oriental Paramaconi | El Tigre | Anzoategui | YV6COP |
| Caroni | Puerto Ordaz | Bolivar | YV6RV |
| Orinoco | Ciudad Bolivar | Bolivar | YV6RB |
| *Circuito 7* | | | |
| Guillermo Tovar | Carupano | Sucre | YV7CR |
| Gran Mariscal de Ayacucho | Cumana | Sucre | YV7GM |
| General Juan Manuel Valdes | Guiria | Sucre | YV7JMV |
| General Francisco Esteban Gomez | Porlamar | Nueva Esparta | YV7RV |
| *Circuito 8* | | | |
| Fray Lucas de Zaragoza | Maturin | Monagas | YV8RV |
| Benigno Jose Guarecuco | Tucupita | Delta Amacuro | YV8BJG |
| *Circuito 9* | | | |
| Teniente Pedro Camejo | San Fernando de Apure | Apure | YV9TPC |

*Table 1. Branches of the Asociacion de Radioaficionados de Venezuela.*

### NETS

The Red Venezolana de Radioaficionados Net is scheduled daily on 3,760 kHz at the following times: 1100–1300 UTC by Eliseo YV1CCV, 1600–1730 UTC by Tirso YV4CYF, and 2200–2400 UTC by Nubia YV3BOS. The Red Net Internacional YV is held Monday to Friday at 0100–0200 UTC on 14,130 kHz. This very well known Latin American net began during 1968 and is currently conducted by Primitivo YV5EPP. Anybody, anywhere, looking for any city in Latin America is encouraged to joint the net. It is also supported by the local 2-meter FM net of repeaters.

At this time they do not sponsor any certificate, but soon they will be announcing something. They own two 2m-FM repeaters, one at Coro (YV1) 147.300 +600 that covers part of the Netherlands Antilles and the second is near Caracas at 147.090 +600. This is also very often activated by DX stations from the Caribbean area and Argentina, too.

Of course the ARV has also a national coordinator for civil defense and is, hence, a link with government authorities in the event of disasters. He is responsible for calling the emergency net if needed.

### EXPEDITION TO CHURUM-VENA

The Pomones, aborigines who populate the lands to the south of the Orinoco river, call the widely known Angel Falls "Churum-Vena." This name is mistaken by many people, even in Venezuela, and many times it is heard that the original name of the Angel Falls is "Churum-Meru." In fact, expeditions there are advertised as expeditions to the Churum-Meru, and people think this is the name of the falls. I'll explain, so keep reading.

To make a visit to the Angel Falls, it is necessary to take a plane trip to Canaima National Park. The park has an area of 30,000 square kilometers—almost as large as the whole area of Belgium. Northwest of this park, on the banks of Canaima Lagoon, there is a site facing Hacha Falls named Canaima Camp. The camp is sponsored by a national airline. The Hacha Falls are a wide series of falls similar to those at Niagara but with not so much volume of water. At the foot of the falls, the Carrao river widens to two times its normal width and forms a lagoon. All around this territory there are big, flat-topped, rock mountains whose straight sides rise abruptly; they are named tepuys by the aborigines and plateaus by geologists.

The Canaima Camp has cabins all around the place for the guests arriving at the park. A dining room, bar, and other

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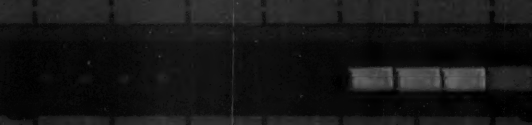

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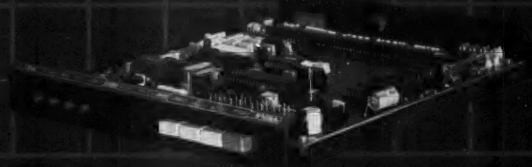

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facilities are on the hill above the river bank. Almost daily several excursions depart from the camp to the nearby waterfalls. Most last for a couple of hours. If the weather is good, the airline routes its planes near the falls so that you can appreciate them from the air before landing or after departure. The fact is that if weather is OK to see them by air, it is not good for going to the falls on the ground, for ground travel is by river, and good weather means no rains and too shallow waters for the canoes.

The Churum-Vena are some 40 km southeast of Canaima Camp. The Falls' expeditions go on 5-day round trips up the river during the rainy season when the river is high (from June to December), by motorized canoe. The expeditioners carry coats, sleeping bags, blankets (nights are cold), hats, etc. This *river* is named Churum-Meru, and *that's* why some people think the waterfall name is Churum-Meru instead of Churum-Vena.

The plateau is named Auyan-Tepuy and only very few people have been up there. There is a man that lives nearby and knows how to go up, but he doesn't want to reveal the secret to any except the very few who are guided by him. Most expeditions to the top of the plateaus go from the west side of the plain and take several weeks; these are not recommended for tourists. The 7-day trip to the foot of the waterfalls is not recommended for children less than 15 years old.

The falls start from a river formed 70 meters below the surface of the plateau. The free fall plunges 980 meters—that's 20 times as high as Niagara Falls. The underground river is formed by the rain that falls over the plateau and then seeps through the fissures in the terrain. Most of the area atop the plain is swamp and the air is damp and warm. The plain is accessible by air only from mid-March to mid-May. The rest of the year it is covered by a heavy fog.

On the tepuys small black scorpions live, a species that has existed for 500 million years. Also there is a small black toad that cannot jump; instead, he walks and climbs over the moist rocks. The soil is very poor and there are strange plants unique to the area. Because of poor soils, many plants populating the area get their nutrients from insects; they are known as carnivorous plants. But don't worry; they won't eat hams!

It is atop the Churum-Vena, in the Auyan-Tepuy, that 12 amateurs from the ARV are planning—as I write this—to call CQ on March 30, 31, and April 1. The station's special call is 4M5ARV/6 and they plan to transmit on 6 bands and in three modes. The most important thing is that by the time you read this, an amateur-radio expedition may have taken place to this remote and unique location.


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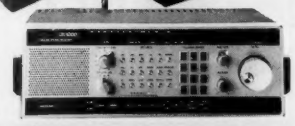

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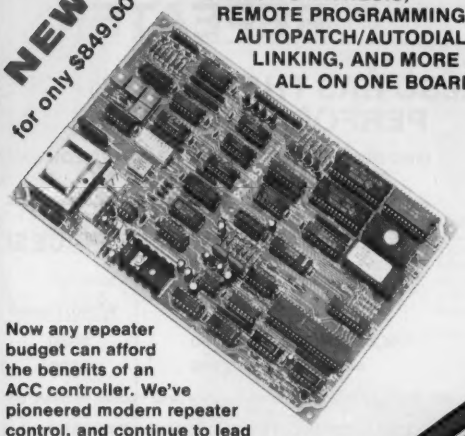

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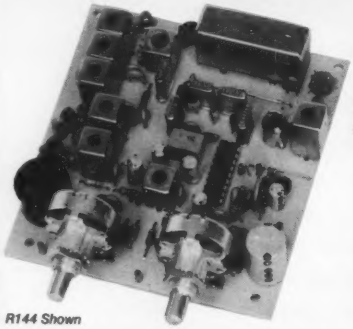

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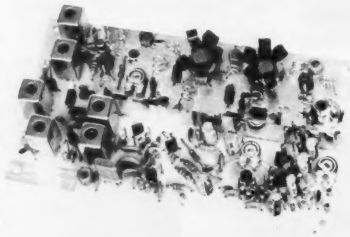

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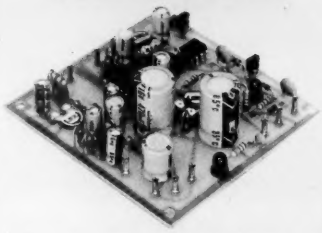

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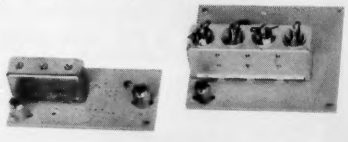

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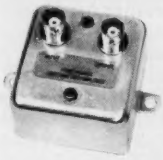


*Models LNA( ), P30, and P432 shown*

| Model | Tunable Freq Range | Noise Figure | Gain | Price |
|---|---|---|---|---|
| LNA 28 | 20-40 | 0.9 dB | 20 dB | $39 |
| LNA 50 | 40-70 | 0.9 dB | 20 dB | $39 |
| LNA 144 | 120-180 | 1.0 dB | 18 dB | $39 |
| LNA 220 | 180-250 | 1.0 dB | 17 dB | $39 |
| LNA 432 | 380-470 | 1.0 dB | 18 dB | $45 |
| LNA 800 | 470-960 | 1.2dB | 15 dB | $45 |

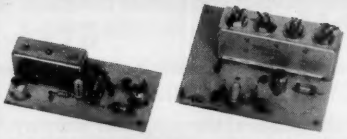
## ECONOMY PREAMPS

Our traditional preamps, proven in years of service. Over 20,000 in use throughout the world. Tuneable over narrow range. Specify exact freq. band needed. Gain 16-20 dB. NF = 2 dB or less. VHF units available 27 to 300 MHz. UHF units available 300 to 650 MHz.

- P30K, VHF Kit less case $18
- P30W, VHF Wired/Tested $33
- P432K, UHF Kit less case $21
- P432W, UHF Wired/Tested $36

P432 also available in broadband version to cover 20-650 MHz without tuning. Same price as P432; add "B" to model #.

## HELICAL RESONATOR PREAMPS



Our lab has developed a new line of low-noise receiver preamps with helical resonator filters built in. The combination of a low noise amplifier similar to the LNA series and the sharp selectivity of a 3 or 4 section helical resonator provides increased sensitivity while reducing intermod and cross-band interference in critical applications. See selectivity curves at right. Noise figure = 1 to 1.2 dB. Gain = 12 to 15 dB.

| Model | Tuning Range | Price |
|---|---|---|
| HRA-144 | 143-150 MHz | $49 |
| HRA-220 | 213-233 MHz | $49 |
| HRA-432 | 420-450 MHz | $59 |
| HRA-( ) | 150-174MHz | $69 |
| HRA-( ) | 450-470 MHz | $79 |

## RECEIVING CONVERTERS

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

| | Antenna Input Range | Receiver Output |
|---|---|---|
| VHF MODELS | 28-32 | 144-148 |
| | 50-52 | 28-30 |
| Kit with Case $49 | 50-54 | 144-148 |
| Less Case $39 | 144-146 | 28-30 |
| Wired $69 | 145-147 | 28-30 |
| | 144-144.4 | 27-27.4 |
| | 146-148 | 28-30 |
| | 144-148 | 50-54 |
| | 220-222 | 28-30 |
| | 220-224 | 144-148 |
| | 222-226 | 144-148 |
| | 220-224 | 50-54 |
| | 222-224 | 28-30 |
| UHF MODELS | 432-434 | 28-30 |
| | 435-437 | 28-30 |
| Kit with Case $59 | 432-436 | 144-148 |
| Less Case $49 | 432-436 | 50-54 |
| Wired $75 | 439.25 | 61.25 |

**SCANNER CONVERTERS** Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only $88.

## SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

FM-5 PC Board Kit – **ONLY $178** complete with controls, heatsink, etc. 10 Watts, 5 Channels, for 2M or 220 MHz.

Cabinet Kit, complete with speaker, knobs, connectors, hardware. Only $60.

REPEAT OF A SELLOUT!

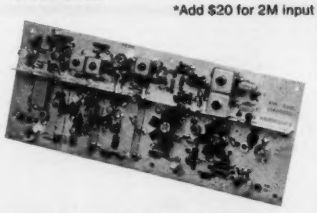
While supply lasts, get $60 cabinet kit free when you buy an FM-5 Transceiver kit. Where else can you get a complete transceiver for only $178

## TRANSMIT CONVERTERS

For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

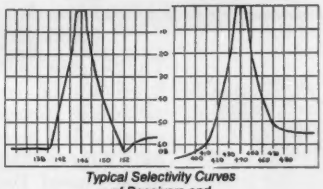
| | Exciter Input Range | Antenna Output |
|---|---|---|
| For VHF, | 28-30 | 144-146 |
| Model XV2 | 28-29 | 145-146 |
| Kit $79 | 28-30 | 50-52 |
| Wired $149 | 27-27.4 | 144-144.4 |
| (Specify band) | 28-30 | 220-222* |
| | 50-54 | 220-224 |
| | 144-146 | 50-52 |
| | 50-54 | 144-148 |
| | 144-146 | 28-30 |
| For UHF, | 28-30 | 432-434 |
| Model XV4 | 28-30 | 435-437 |
| Kit $99 | 50-54 | 432-436 |
| Wired $169 | 61.25 | 439.25 |
| | 144-148 | 432-436* |

*Add $20 for 2M input



**VHF & UHF LINEAR AMPLIFIERS.** Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

## LOOK AT THESE ATTRACTIVE CURVES!



*Typical Selectivity Curves of Receivers and Helical Resonators.*

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# John J. Meshna Jr., Inc. ↩122

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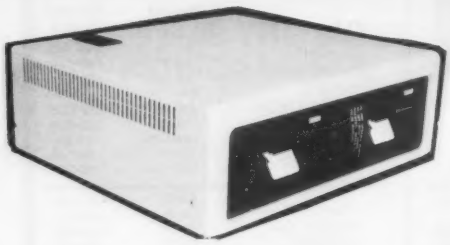
## DUAL FLOPPY DISC DRIVES

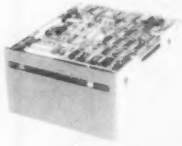


BRAND NEW, dual floppy disc drives made for Digital Equipment Corp. (DEC model no. RX 180 AB). This beautiful piece of computer hardware consists of 2 Shugart compatible TEAC 40 track, double density, 5¼" mini-floppy disc drives brand new in the case with their own regulated, switching power supply, cooling fan & on/off switch. Each unit also comes with a line cord & documentation. These were made for DEC, but are also compatible with other personal computers such as IBM, TRS 80 models I, II, III, & the Color Computer, and other Shugart compatible interfaces. Naturally you supply the cables and disc controller card to suit your particular system. The RX 180 AB runs off of 115/230 VAC 50/60 Hz. w/out any modifications to the drives. Each system comes in the original factory box and are guaranteed functional. A blockbuster of a buy !! Shpg. wt. 20 lb. Stock no. RX 180 AB $250.00

## HIGH SPEED KSR PRINTER TERMINAL

World famous, high speed G. E. Terminet 1200 RS 232 KSR printer terminals are now in stock ready for shipment to you. This has to be one of the finest letter quality printers ever offered at a bargain price. These terminals can be used as an RS 232 asynchronous communications terminal or used in the local mode as a typewriter. The terminals were removed from service for upgrading. Highlights of these machines are: Standard RS 232, full duplex, asynchronous data comm., fully formed upper and lower case letters, 128 character ASCII set, selectable baud rates of 110, 300, or 1200 BPS, 80 columns on pin feed paper, and less weight & size than an ASR 35 teletype with far less racket. They are virtually electronically foolproof as every pc board is Pico fuse protected. Should your machine not work, just check the on board fuses & 9 out of 10 times that is where the problem lies. Schematics are provided w/ each machine sold. Current price of this machine new is over $2000.00 ! Our meager price for this fantastic printer is only 10% of this: $200.00 each!!! Visually inspected prior to shipment to insure completeness. Shpd. truck freight collect. $200.00

## 5 MEGABYTE SEAGATE ST 506 5¼" MICROWINCHESTER HARD DISC DRIVES



The Seagate Technology ST 506 MicroWinchester hard disc drives are identical in size and mounting configuration to the industry standard 5¼" mini-floppy disc drives. These drives utilize 2 5¼" fixed platters as storage media. Each surface employs 1 read/write head to service 153 tracks. The storage capacity is 5 megabytes formatted ! The voltage requirements are only 5vdc 700ma & 12vdc 1.6 amps hardly more than a regular mini-floppy drive. The drives we have are in beautiful condition and look to be unused. Each one comes with factory literature which includes the pinouts. The ST 506's will run with computer systems from Kaypro, IBM, Xerox, and other Shugart compatible interfaces when used with the proper controller card (not provided). Only 10 pieces in stock, so order early.
Seagate ST 506 Shpg. wt. 9 lb. $300.00 2/$575.00

IBM model no. 745

## NEW IBM SELECTRIC BASED TYPEWRITER PRINTERS

Send for free data sheet.

These rugged, handsome printers were made for one of the giants of the computer industry. They can be used as a standard typewriter or as a printer in a word processing system for true letter quality printing. Solenoids were added to the selectric mechanism which disabled the manual repeat function but still allows electronic repeat functions. It uses standard IBM typing balls. The voltage requirements are standard 115 vac, 5 vdc @ 100 ma, & 24 vdc @ 4 amps. All are new in factory boxes, but may require adjustments. We provide literature and schematics with 1 ribbon & cleaning tools. With the addition of our Centronics to Selectric I/O adapter, you could easily interface this printer to almost any micro computer system.
Typewriter Printer stock no. RE 1000A $375.00 shpg wt. approx. 80 lb. shpd. by truck collect.
Centronics to Selectric adapter. Fully tested & operational $245.00 Shpd. UPS 15 lb.

## SHUGART 901 8" FDD

We just got in a small lot of nice clean world reknown Shugart 8" disc drives. Single side, single density units. Each drive will come with data on using the 901's in 801 compatible systems which should make them very versatile. Schematics are also provided. Used, good condition. Shpg. wt. 15 lb. $75.00

## BA 279 BATTERIES

Unused surplus from Uncle Sam. Output is 135v, 67½ v, 6v, & 1½v. Socket is made to fit plug from PRC 8,9,& 10. May fit other rigs as well. Current list price is $42.25. Our price is only $15.00 Shpg. wt. 9 lb.

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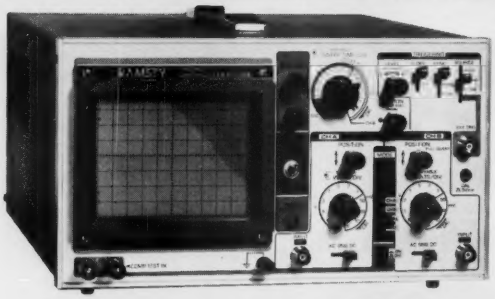

## NEW FROM RAMSEY–20 MHz DUAL TRACE OSCILLOSCOPE

Unsurpassed quality at an unbeatable price, the Ramsey oscilloscope compares to others costing hundreds more. Features include a component testing circuit that will allow you to easily test resistors, capacitors, digital circuits and diodes • TV video sync filter • wide bandwidth & high sensitivity • internal graticule • high quality rectangular CRT • front panel trace rotator • Z axis • high sensitivity x-y mode • very low power consumption • regulated power supply • built-in calibrator • rock solid triggering • high quality hook-on probes

**$399.95** high quality hook-on probes included

### RAMSEY D-1100 VOM-MULTITESTER

Compact and reliable, designed to service a wide variety of equipment. Features include • mirror back scale • double-jeweled precision moving coil • double overload protection • an ideal low cost unit for the beginner or as a spare back-up unit.

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test leads and battery included

### RAMSEY D-2100 DIGITAL MULTITESTER

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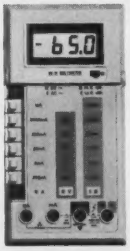
**$54.95**

$h_{FE}$ test leads, battery & vinyl carrying case included



### RAMSEY D-3100 DIGITAL MULTIMETER

Reliable, accurate digital measurements at an amazingly low cost • In-line color coded push buttons, speeds range selection • abs plastic tilt stand • recessed input jacks • overload protection on all ranges • 3½ digit LCD display with auto zero, auto polarity & low BAT. indicator

**$59.95**

test leads and battery included

### CT-70 7 DIGIT 525 MHz COUNTER

Lab quality at a breakthrough price. Features • 3 frequency ranges each with pre amp • dual selectable gate times • gate activity indicator • 50mV @ 150 MHz typical sensitivity • wide frequency range • 1 ppm accuracy

**$119.95**

wired includes AC adapter

CT-70 kit ..... $99.95
BP-4 nicad pack ..... 8.95

### CT-90 9 DIGIT 600 MHz COUNTER

The most versatile for less than $300. Features 3 selectable gate times • 9 digits • gate indicator • display hold • 25mV @ 150 MHz typical sensitivity • 10 MHz timebase for WWV calibration • 1 ppm accuracy

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OV-1 0.1 PPM oven timebase ... 59.95
BP-4 nicad pack ..... 8.95

### CT-125 9 DIGIT 1.2 GHz COUNTER

A 9 digit counter that will outperform units costing hundreds more. • gate indicator • 24mV @ 150 MHz typical sensitivity • 9 digit display • 1 ppm accuracy • display hold • dual inputs with preamps

**$169.95**

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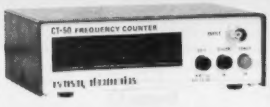
BP-4 nicad pack ..... 8.95



### CT-50 8 DIGIT 600 MHz COUNTER

A versatile lab bench counter with optional receive frequency adapter, which turns the CT-50 into a digital readout for most any receiver • 25 mV @ 150 MHz typical sensitivity • 8 digit display • 1 ppm accuracy

**$169.95**

wired

CT-50 kit ..... $139.95
RA-1 receiver adapter kit ..... 14.95

### DM-700 DIGITAL MULTIMETER

Professional quality at a hobbyist price. Features include 26 different ranges and 5 functions • 3½ digit, ½ inch LED display • automatic decimal placement • automatic polarity

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wired includes AC adapter

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### PS-2 AUDIO MULTIPLIER

The PS-2 is handy for high resolution audio resolution measurements, multiplies UP in frequency • great for PL tone measurements • multiplies by 10 or 100 • 0.01Hz resolution & built-in signal preamp/conditioner

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PS-1B kit ..... $49.95

### ACCESSORIES FOR RAMSEY COUNTERS

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| High impedance probe, light loading | 16.95 |
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| Tilt bail, for CT-70, 90, 125 | 3.95 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 14 | 7A | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14 |
| ARGENTINA | 21 | 14 | 14 | 14 | 7 | 7 | 14 | 14A | 21 | 21A | 21A | 21 |
| AUSTRALIA | 21 | 14 | 14 | 7B | 7B | 7B | 7 | 7 | 7B | 7B | 14A | 14A |
| CANAL ZONE | 14A | 14 | 14 | 7 | 7 | 7 | 14 | 14 | 14 | 14A | 21 | 21 |
| ENGLAND | 7A | 7 | 7 | 7 | 7 | 7A | 14 | 14 | 14A | 14A | 14A | 14 |
| HAWAII | 21 | 14 | 14 | 7B | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14A |
| INDIA | 14 | 14 | 7B | 7B | 7B | 7B | 14 | 14 | 14 | 14 | 14 | 14 |
| JAPAN | 14A | 14 | 7B | 7B | 7B | 7 | 7 | 7 | 14 | 14 | 14 | 14 |
| MEXICO | 14A | 14 | 14 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 21 | 14A |
| PHILIPPINES | 14A | 14B | 14B | 7B | 7B | 7B | 7B | 14B | 14 | 14 | 14 | 14 |
| PUERTO RICO | 14A | 14 | 14 | 7A | 7 | 7 | 14 | 14 | 14 | 14 | 14A | 14A |
| SOUTH AFRICA | 7B | -7 | 7 | 7B | 7B | 14 | 14 | 14A | 21 | 21A | 14 | 14 |
| U. S. S. R. | 14B | 7 | 7 | 7 | 7 | 7B | 14 | 14 | 14 | 14A | 14A | 14 |
| WEST COAST | 14A | 14A | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14A | 14A |

## CENTRAL UNITED STATES TO:

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 14 | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14 |
| ARGENTINA | 21 | 14A | 14 | 14 | 7 | 7 | 14 | 14A | 21 | 21A | 21A | 21 |
| AUSTRALIA | 21 | 14A | 14 | 7B | 7B | 7B | 7 | 7 | 7B | 7B | 14A | 14A |
| CANAL ZONE | 21 | 14 | 14 | 7 | 7 | 7 | 14 | 14 | 14A | 14A | 21A | 21A |
| ENGLAND | 7A | 7 | 7 | 7 | 7 | 7 | 7A | 14 | 14 | 14 | 14A | 14 |
| HAWAII | 21 | 14A | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14A | 14A |
| INDIA | 14 | 14 | 14 | 7B | 7B | 7B | 7B | 14B | 14 | 14 | 14 | 14 |
| JAPAN | 14A | 14A | 14B | 7B | 7B | 7 | 7 | 7 | 14 | 14 | 14 | 14 |
| MEXICO | 14 | 14 | 7 | 7 | 7 | 7 | 7 | 7A | 14 | 14 | 14 | 14 |
| PHILIPPINES | 14A | 14 | 14B | 7B | 7B | 7B | 7B | 14B | 14 | 14 | 14 | 14 |
| PUERTO RICO | 21 | 14A | 14 | 7 | 7 | 7 | 14 | 14 | 14 | 14A | 21 | 21 |
| SOUTH AFRICA | 7B | 7 | 7 | 7B | 7B | 7B | 14 | 14 | 14 | 14A | 14 | 14 |
| U. S. S. R. | 14B | 7 | 7 | 7 | 7 | 7B | 14B | 14 | 14 | 14 | 14 | 14 |

## WESTERN UNITED STATES TO:

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 14 | 7A | 7 | 7 | 3A | 3A | 7 | 14 | 14 | 14 | 14 |
| ARGENTINA | 21 | 14A | 14 | 14 | 7 | 7 | 7B | 14A | 21 | 21A | 21A | 21 |
| AUSTRALIA | 21A | 21 | 21 | 14 | 14 | 14 | 7 | 7 | 7B | 7B | 14A | 21A |
| CANAL ZONE | 21 | 14 | 14 | 7 | 7 | 7 | 7A | 14 | 14 | 14A | 21A | 21A |
| ENGLAND | 7AB | 7 | 7 | 7 | 7 | 7 | 7B | 14B | 14 | 14 | 14 | 14 |
| HAWAII | 21A | 21 | 14A | 14 | 14 | 7A | 7 | 7 | 14 | 14A | 21 | 21 |
| INDIA | 14 | 14 | 14 | 14 | 7B | 7B | 7B | 14B | 14 | 14 | 14 | 14 |
| JAPAN | 14A | 14A | 14 | 14B | 14B | 7 | 7 | 7 | 14 | 14 | 14 | 14A |
| MEXICO | 14A | 14 | 14 | 7 | 7 | 7 | 7A | 14 | 14 | 14 | 14A | 14A |
| PHILIPPINES | 14A | 14 | 14 | 14B | 14B | 7B | 7B | 14B | 14 | 14 | 14 | 14A |
| PUERTO RICO | 21 | 14A | 14 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 21 | 21 |
| SOUTH AFRICA | 7B | 7 | 7 | 7B | 7B | 7B | 7B | 14 | 14 | 14 | 14 | 14 |
| U. S. S. R. | 14B | 7B | 7 | 7 | 7 | 7B | 7B | 14B | 14 | 14 | 14 | 14B |
| EAST COAST | 14A | 14A | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14A | 14A |

**A = Next higher frequency band may also be useful.**
**B = Difficult circuit this period.**

**First letter = night waves. Second = day waves.**
**G = Good, F = Fair, P = Poor. * = Chance of solar flares.**
**# = Chance of aurora.**

**NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.**

## May

| SUN | MON | TUE | WED | THU | FRI | SAT |
|---|---|---|---|---|---|---|
| | | 1 G/G | 2 F/G | 3 F/F | 4 F/G | 5 F/G |
| 6 F/G | 7 F/G | 8 G/G | 9 G/G | 10 G/G | 11 F/F | 12 P/F |
| 13 P/F | 14 F/F | 15 F/G | 16 F/G | 17 G/G | 18 G/G | 19 G/G |
| 20 G/G | 21 F/G | 22 P/F | 23 F/F | 24 G/G | 25 G/G | 26 G/G |
| 27 F/G | 28 F/G | 29 G/G | 30 G/G | 31 F/F | | |

# FT-77 The Rig for All Seasons!

**Answering the call for an HF rig that goes everywhere, sounds great, and is cost-effective, Yaesu proudly introduces the FT-77 Compact HF Transceiver System.**

**Computerized Design and Manufacture**
The FT-77 design engineers utilized the latest computerized circuit board layout methods, resulting in a compact, reliable transceiver with maximum utilization of available space. Automated insertion techniques are used in assembly, providing improved reliability and quality control over earlier designs.

**Operating Versatility**
The FT-77 is equipped for operation on all amateur bands between 3.5 and 29.7 MHz, including the three new WARC bands. Fully operational on SSB and CW, the FT-77 includes a dual width noise blanker (designed to minimize the "Woodpecker" or ignition noise), full SWR metering, R.I.T., and optional CW filter with wide/narrow selection. The optional FM-77 permits operation on the FM mode, with front panel squelch sensitivity control.

**Expandable Station Concept**
Ideal for mobile operation because of its compact size and light weight, the FT-77 forms the nucleus of a versatile base station. Available as options for the FT-77 are the FP-700 AC Power Supply, FV-700DM Synthesized External VFO and Memory System, FTV-707 VHF/UHF Transverter, and FC-700 Antenna Coupler, providing top performance at an extraordinarily low price.

**Best of All, It's a Yaesu!**
With most experience in transceiver design and manufacture, the Yaesu trademark is your guarantee of quality and durability. We've got all-new technology and an all-new warranty policy to back it up.

**See the FT-77 and the all new line of Yaesu HF, VHF, and UHF transceivers, receivers and accessories at your Yaesu Dealer today! *It's time you tried a Yaesu!***

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**YAESU Cincinnati Service Center, 9070 Gold Park Dr. Hamilton, Ohio 45011 ● (513) 874-3100**

# KENWOOD

*pacesetter in amateur radio*

## TS-430S "Digital DX-terity!"

# TS-430S

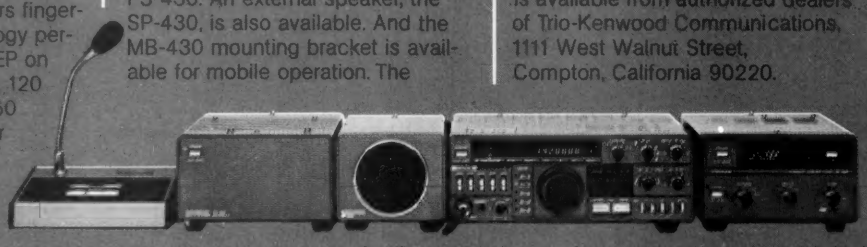
Digital DX-terity, that outstanding attribute built into every KENWOOD TS-430S that lets you QSY from band to band, frequency to frequency, and from mode to mode with the speed and ease that will give you a dominant position in DX operations.

KENWOOD'S TS-430S, a revolutionary, ultra-compact, HF transceiver has already won the hearts of radio Amateurs the world over. It covers 160-10 meters, including the new WARC bands (easily modified for HF MARS). Its high dynamic range receiver tunes from 150 kHz-30 MHz. It utilizes an innovative UP conversion PLL circuit for superior frequency stability and accuracy. Two digital VFO's allow fast split-frequency operations. A choice of USB, LSB, CW, or AM, with FM optional, are at the operators fingertips. All Solid-state technology permits inputs of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.

Eight memories store frequency, mode, and band data, with Lithium battery memory back-up. Memory scan and programmable automatic band scan help speed up operations. An IF shift circuit, a tuneable notch filter, and a Narrow-Wide switch for IF filter selection help eliminate QRM. It has a built-in speech processor. A fluorescent tube digital display makes tuning easy and fast. An all-mode squelch circuit, a noise blanker, and an RF attenuator control help clean up the signal. And there's a VOX circuit, plus semi-break-in, with side-tone. All-in-all, it just could be that the expression "Digital DX-terity" is a bit of an understatement.

**TS-430S Optional Accessories:** In typical KENWOOD fashion, there are plenty of optional accessories for this great HF transceiver. There is a special power supply, the PS-430. An external speaker, the SP-430, is also available. And the MB-430 mounting bracket is available for mobile operation. The AT-250 automatic antenna tuner was designed primarily with the TS-430S in mind, and for those who prefer to "roll their own," the AT-130 antenna tuner is available. The FM-430 FM unit is available for FM operations. The YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters, the YK-88SN SSB filter, and the YK-88A AM filter may be easily installed for serious DX-ing. An MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, an MC-42S mobile hand mic., and an MC-55 8-pin mobile microphone, are available, depending on your requirements. TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter 160~6 meter, SW100A SWR/power/volt meter 160-2m, HS-4, HS-5, HS-6, HS-7 headphones, are also available.

More information on the TS-430S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.



*Specifications and prices are subject to change without notice or obligation.*